

CHALLENGES AND OPPORTUNITIES FOR OIL AND GAS DEVELOPMENT IN DIFFERENT PRICE ENVI- RONMENTS

HEARING BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE ONE HUNDRED FOURTEENTH CONGRESS SECOND SESSION

APRIL 26, 2016



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CHALLENGES AND OPPORTUNITIES FOR OIL AND GAS DEVELOPMENT IN DIFFERENT PRICE ENVIRONMENTS

TUESDAY, APRIL 26, 2016

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The Committee met, pursuant to notice, at 10:07 a.m. in Room SD-366, Dirksen Senate Office Building, Hon. Lisa Murkowski, Chairman of the Committee, presiding.

OPENING STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

The CHAIRMAN. Good morning. The Committee will come to order.

The subject of challenges and opportunities in oil and gas development under different price environments is certainly one of national significance. There has been a lot of discussion in the news about what these low oil prices mean for us as a nation and truly given the geopolitics of oil, but it has impact, certainly, for our security, for our economy and for the environment itself.

A special thank you to our witnesses today, all of whom had agreed to testify last week but you were bumped and we apologize for that. But we do not apologize that we were able to get the energy bill to the floor. So we are sorry for any inconvenience but hope that you find some comfort in the fact that you were moved off to the sidelines for a very important legislative priority here. It allowed the first significant energy reform package to clear the Senate in nearly a decade. I think the Committee is proud of that and I thank all of my colleagues for their support in making that happen.

Oil and gas prices are low today, but I think we all recognize they are not going to be low forever. They come and they go. In fact, the only way that drawdowns from the Strategic Petroleum Reserve fill revenue gaps on paper is because CBO assumes price levels in the future to double to perhaps \$80 or more from today's level hanging around \$40 a barrel.

Oil and gas production is heavily capital intensive. It takes a long time for these projects to come online. The Energy Information Administration (EIA), for example, we were just speaking about this when I came in, estimates that the development in the non-wilderness portion of ANWR would take 8 to 12 years after legisla-

tion is enacted to open up the 10 02 area for exploration or production.

I joined the Alaska State Legislature at a time when oil was at \$9 a barrel. For an oil producing state, that was a pretty tough reality for us. As we were looking at legislative issues, we were actually debating whether or not we had enough funding within the state's budget to provide for bullets for the state troopers as they go out to provide for a level of safety.

We had some really tough decisions to make. Our executive and legislative branches, at the time they were controlled by Democrats and Republicans so it was not all tilted in favor of one party, but they all worked diligently to ensure that our public policy remained attractive to resource development because we are a resource development state so we needed to be able to attract resource investment. I think that that should be part of our goal, to ensure that America remains an attractive place to produce the resources that we need and will use right here at home.

When you look at our energy mix that means that we need to provide new access, we need to establish reasonable systems for leasing and development and we need to reform what is often an overly cumbersome permitting process.

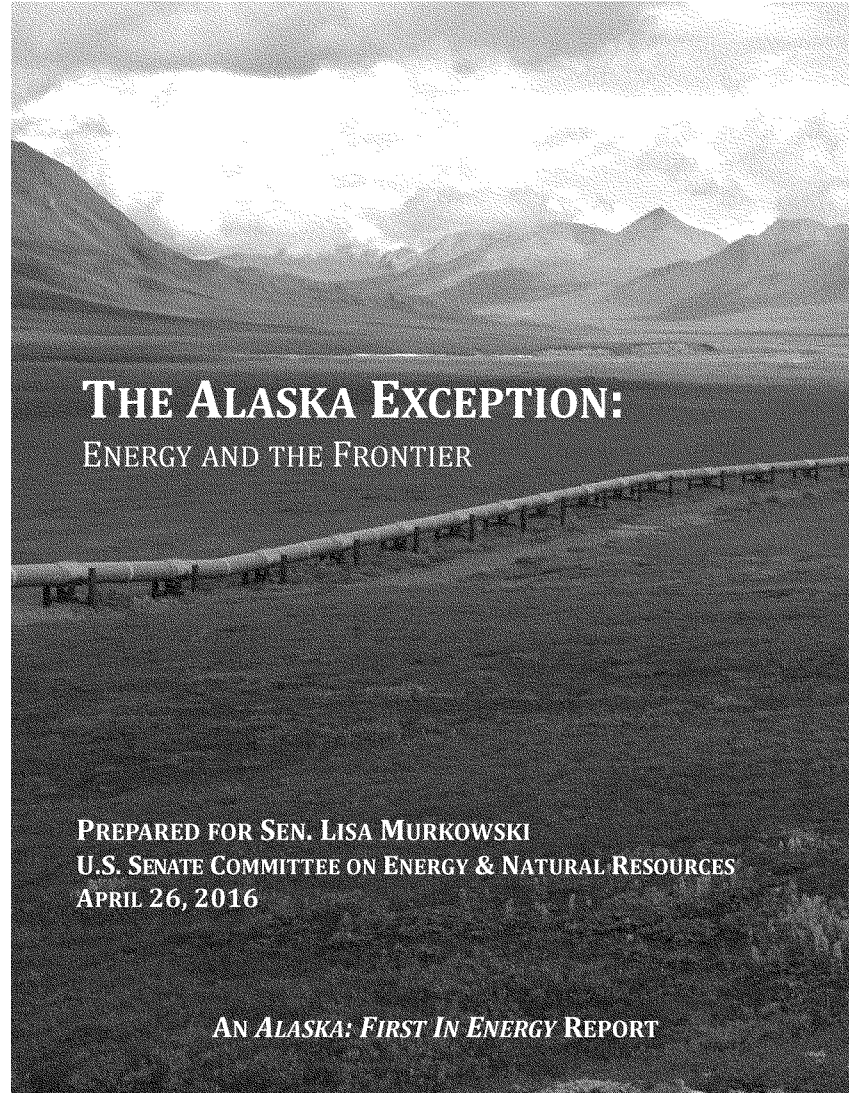
Right now, we do not have that system at the Federal level, but with policy improvements I think we can get there. I think we should be tackling this right now not the next time that oil is sitting at \$100 a barrel or even more.

So today I am pleased to announce to my colleagues, and you should be receiving a copy, but we have launched a new series of white papers. For those of you that have been on the Committee for some time, you know that we like to provide you with these thoughtful, insightful papers about major initiatives in the energy space that we have been focused on. We take a pretty rigorous analysis, and we build the case. We built the case for oil exports. We built the case with the Energy 20/20 white paper that we had released at the start of 2013.

We have moved through a series of other initiatives where, again, we lay forth the efforts that we are focusing on. So it was the efforts to expedite LNG exports, again, lift the ban on oil exports. These were all supported by a series of staff reports on condensate, on cross border swaps and much else that we actually saw got adopted by the Administration.

Today I have got a new report out there, a new white paper. We are calling it the "Alaska Exception, Energy and the Frontier." It is the first in a series that we are entitling "Alaska, First in Energy."

[The information referred to follows:]



The Alaska Exception: Energy and the Frontier

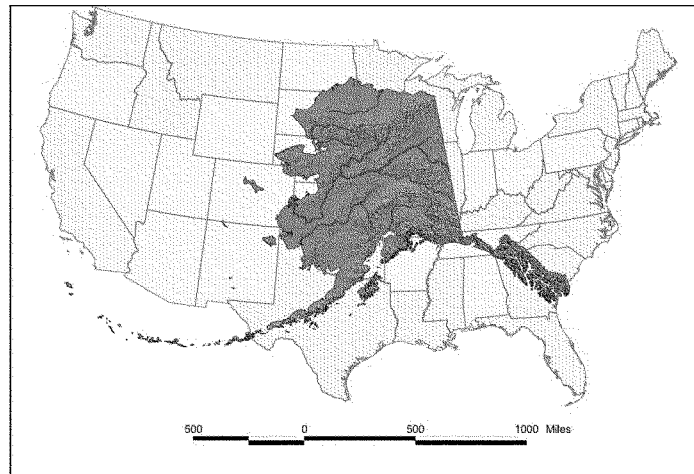
Prepared by Majority Staff for Chairman Lisa Murkowski
U.S. Senate Committee on Energy & Natural Resources
April 26, 2016

Introduction

To describe the State of Alaska as “unique” would be an understatement. The U.S. Energy Information Administration (EIA) summarizes its exceptional attributes as follows:

“Alaska, the largest U.S. state by area, is one-fifth the size of the Lower 48 states and, with the Aleutian Island chain, as wide as the Lower 48 states from east to west. It is the only state with territory north of the Arctic Circle, and it has the highest mountains and longest coastline of any state. Alaska's winters are frequently severe, but its climate varies significantly from north to south and from winter to summer....Large areas of Alaska remain uninhabited. It has the fourth-smallest population and is the least densely populated of any state.”¹

These geographic dimensions shape Alaskan demographics and economics, particularly in the energy sector. This report highlights several ways in which the federal government's energy policies bestow a degree of special status on the State.



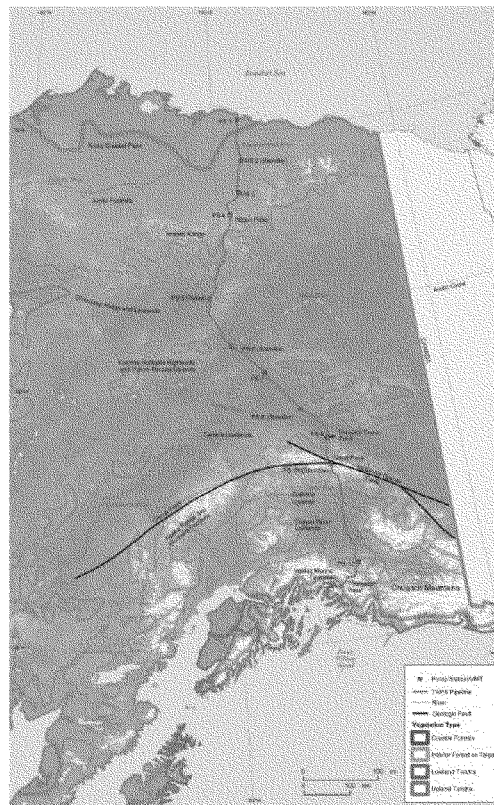
The True Size of Alaska (Source: USDA)

¹ EIA, Alaska State Profile (October 15, 2015): <https://www.eia.gov/state/analysis.cfm?sid=AK>.

Trans-Alaska Pipeline

The bulk of Alaska's oil production occurs on the North Slope. The 800-mile Trans-Alaska Pipeline System (TAPS) transports virtually all of this oil to Valdez, where it is loaded onto tankers and shipped to refineries. The construction of this pipeline required federal legislation, the Trans-Alaska Pipeline Authorization Act, which was signed into law in November 1973. The Act directed the Secretary of the Interior (and supporting agencies) to "take all necessary action to administer and enforce rights-of-way, permits, leases, and other authorizations that are necessary for or related to the construction, operation, and maintenance of the trans-Alaska oil pipeline system." (43 USC §1652(b)).

See Appendix A for additional background information.



The TAPS System (Source: BLM)

Kenai LNG

The Kenai Liquefied Natural Gas (LNG) project has exported natural gas in liquefied form from Alaska's Cook Inlet since 1969, with only one brief interruption. Until this year, it was the only operating liquefaction terminal in North America. Over the course of its lifetime, the project has received numerous federal authorizations – initially from the Federal Power Commission² and later from the Department of Energy – to export natural gas. In part, this unique treatment is due to the plant's small operating capacity, the fact that Alaskan natural gas markets are geographically separated from Lower 48 natural gas markets, and the age of the facilities (i.e., they are "grand-fathered," according to FERC).

See Appendix B for additional background information.



The Arctic Sun Loading at Kenai LNG (Source: ConocoPhillips)

² The Federal Power Commission was the predecessor to the Federal Energy Regulatory Commission (FERC).

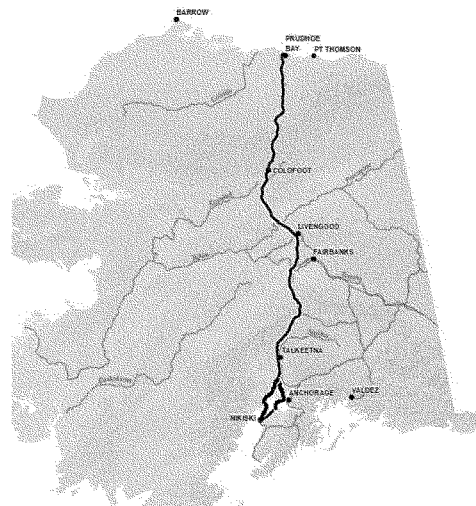
Alaska LNG

Under new administrative procedures established in 2014, liquefaction projects in the Lower 48 will not generally receive “conditional authorizations” to export LNG to non-Free Trade Agreement countries. Instead, the Department of Energy will only consider issuing final authorizations to projects that have completed environmental review by other agencies. The Department noted in its new procedures, however, that Alaska may deserve special treatment:

“The revised procedures will apply only to exports from the lower-48 states. In the Proposed Procedures Notice, DOE stated that no long-term applications to export LNG from Alaska were currently pending and, therefore, DOE could not say whether there may be *unique features of Alaskan projects* that would warrant exercise of the DOE’s discretionary authority to issue conditional decisions.”³ [emphasis added]

Indeed, the proposal to build a gas pipeline from the North Slope to Nikiski, a gas treatment plant at Point Thomson, and a liquefaction facility in Nikiski – the “Alaska LNG” project – received a conditional authorization from the Department of Energy in May 2015. It is the only project to receive such an authorization since the new procedures were implemented.

See Appendix C for additional background information.



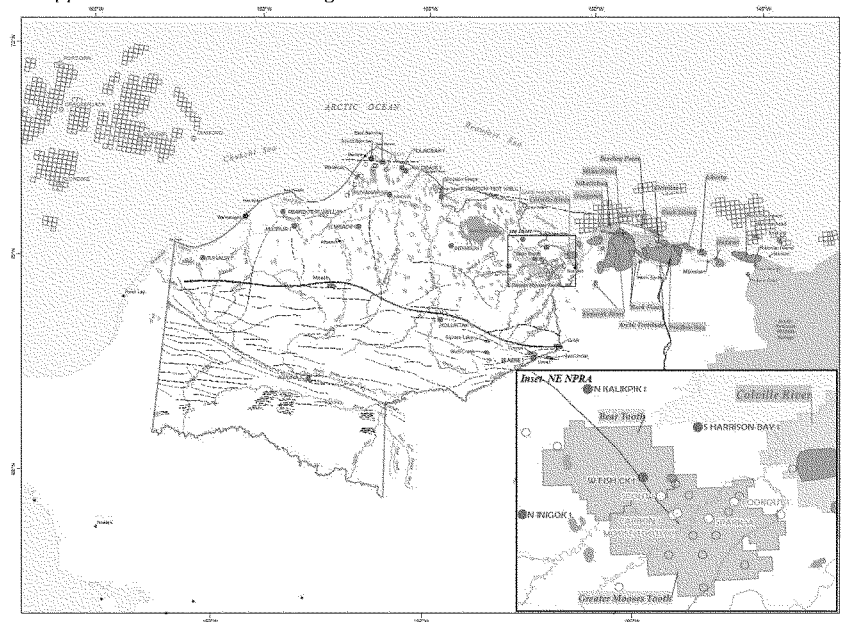
Preliminary Facility Locations (Source: Alaska LNG)

³ DOE, *Procedures for Liquefied Natural Gas Export Decisions* (August 15, 2014): http://energy.gov/sites/prod/files/2014/08/f18/FR%20Procedures%20LNG%20Exports%2008_15_14.pdf.

National Petroleum Reserve-Alaska

The United States once maintained a network of Naval Petroleum Reserves – at Elk Hills and Buena Vista in California, Teapot Dome in Wyoming, and on the North Slope of Alaska. The reserve in Alaska was transferred to the Department of the Interior in 1976 and renamed, while the other sites were transferred to the Department of Energy. The National Petroleum Reserve-Alaska (NPR-A) covers approximately 23 million acres, making it larger than any national park or wildlife refuge. It is the only remaining NPR site in the country and has always held, by far, the most potential for future discoveries. Scattered lease sales have been conducted in NPR-A, which the United States Geological Survey estimates may contain nearly 900 million barrels of oil and just under 53 trillion cubic feet of natural gas.⁴

See Appendix D for additional background information.



NPR-A and the North Slope Oil and Gas Activity (Source: BLM)

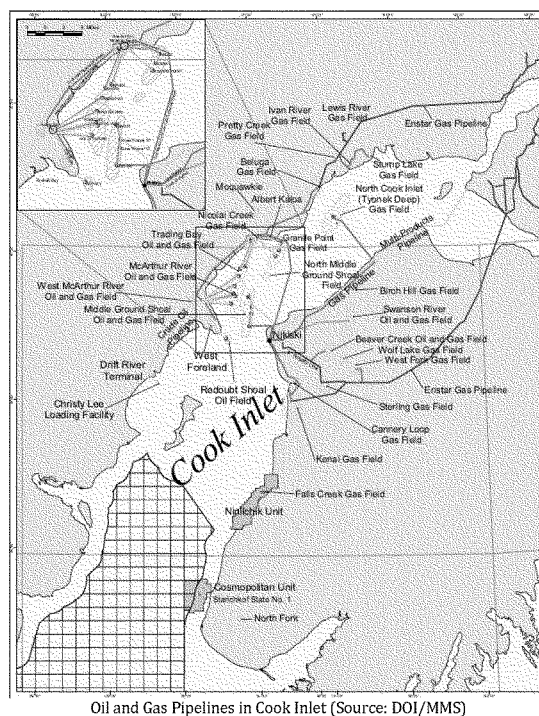
⁴ <http://pubs.usgs.gov/fs/2010/3102/pdf/FS10-3102.pdf>.

Oil Exports from Cook Inlet

In 1975, the United States effectively banned the export of domestic crude oil.⁵ This general prohibition on exportation included oil produced in Alaska. However, the President retained broad power to authorize exports on a selective basis in the national interest. In 1985, the Commerce Department and an interagency group determined that exports of crude oil from Alaska's Cook Inlet would be in the national interest. The final rule stated:

“Without further development of Cook Inlet resources, it is estimated that no more than 20,000 barrels per day may be available for export and most likely only 4,000 to 5,000 barrels per day of state royalty oil may be exported. This quantity would require only a few vessel sailings a year and would have a minimal impact on the shipping industry.”

See Appendix E for additional background information.



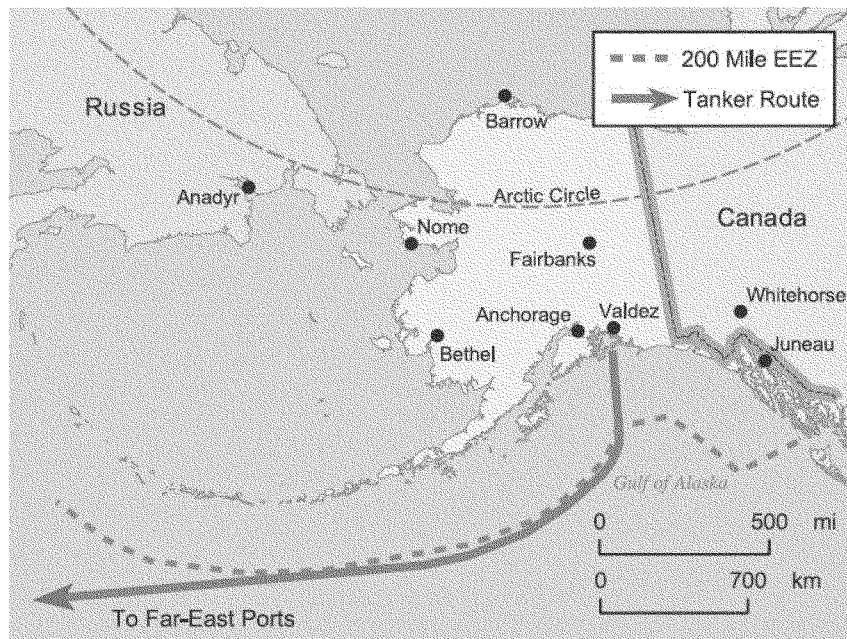
Oil and Gas Pipelines in Cook Inlet (Source: DOI/MMS)

⁵ The general prohibitions were repealed in December 2015.

Oil Exports from TAPS

In 1988, Canada and the United States signed a free trade agreement. Later that year, President Reagan determined that 50,000 barrels per day of Alaskan crude oil shipped through the Trans-Alaska Pipeline System could be exported to Canada. Further, following the passage of Public Law 104-58, President Clinton determined that unlimited exports of oil shipped through TAPS could be exported anywhere in the world. Until the general prohibitions were repealed in December 2015, Alaska remained the only state that could export crude oil beyond Canada.

See Appendices F and G for additional background information.

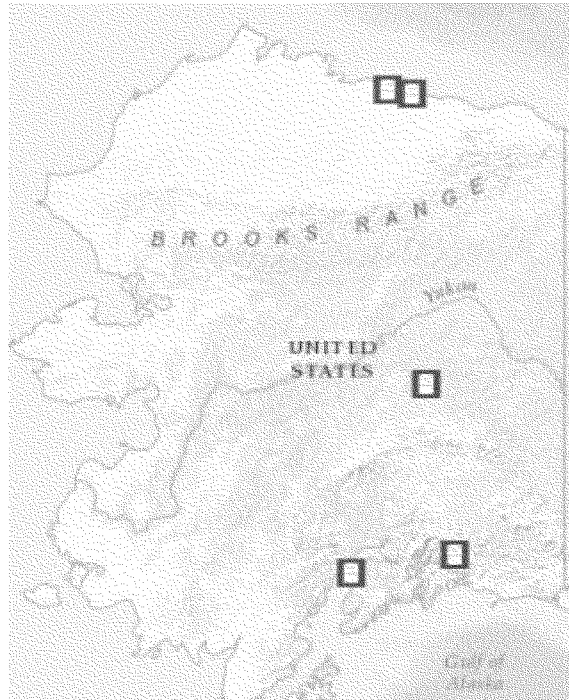


Tanker Routes for Exports to the Far East (Source: BLM)

Renewable Fuel Standard

The Congressional Research Service writes: “The Renewable Fuel Standard (RFS)—established by the Energy Policy Act of 2005 (P.L. 109-58; EPAct05) and expanded in 2007 by the Energy Independence and Security Act (P.L. 110-140; EISA)—mandates that U.S. transportation fuel contain a minimum volume of biofuel. The statute exempts noncontiguous states and territories, but allows them to opt in.” Hawaii elected to opt in, but Alaska did not. The rationale for the exemption was, and remains, that biofuel is not generally produced in Alaska and that it is logistically difficult to transport the volumes that would be needed from the Lower 48 to the State’s small isolated network of refiners.

See Appendix H for additional background information.



Refineries in Alaska (Source: EIA)⁶

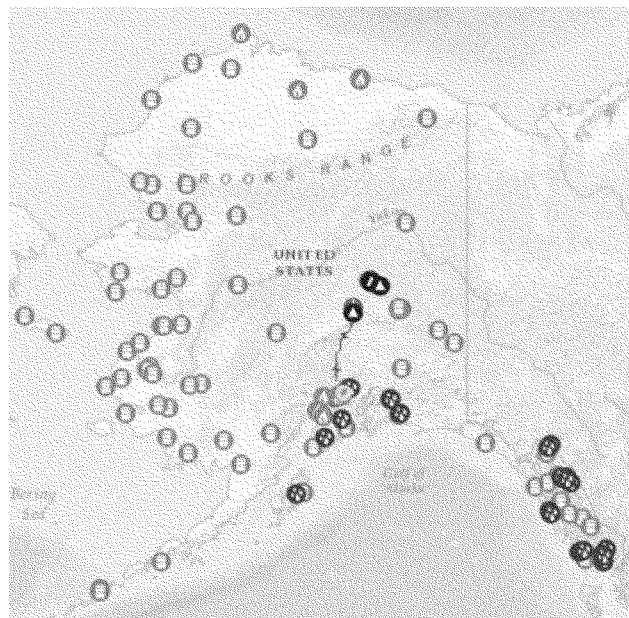
⁶ A refinery at North Pole closed in 2014.

FERC Authority

The Federal Energy Regulatory Commission regulates interstate electric transmission and wholesale sales. FERC does not have public utility-related authority in Hawaii and Alaska, due to the “electrical isolation” of those states.⁷ The EIA explains:

“The electricity infrastructure in Alaska differs from that in the Lower 48 states in that Alaskans are not linked to large, interconnected grids through transmission and distribution lines. Although an interconnected grid called the Railbelt exists in the more populated areas from Fairbanks to south of Anchorage, even that grid is isolated from the electric grids in Canada and the Lower 48 states. Most of the state's rural communities have no grid access and rely on consumer-owned electric cooperatives for their power, and many of those rural power providers use diesel electricity generators. This diesel use contributed to Alaska's ranking second only to Hawaii in the per capita generation of electric power from petroleum liquids.”⁸

See Appendix I for additional background information.



Alaska's Electricity System (Source: EIA)

⁷ <http://www.ferc.gov/about/ferc-does/ferc101.pdf>, p. 12.

⁸ <http://www.eia.gov/state/analysis.cfm?sid=AK>.

Conclusion

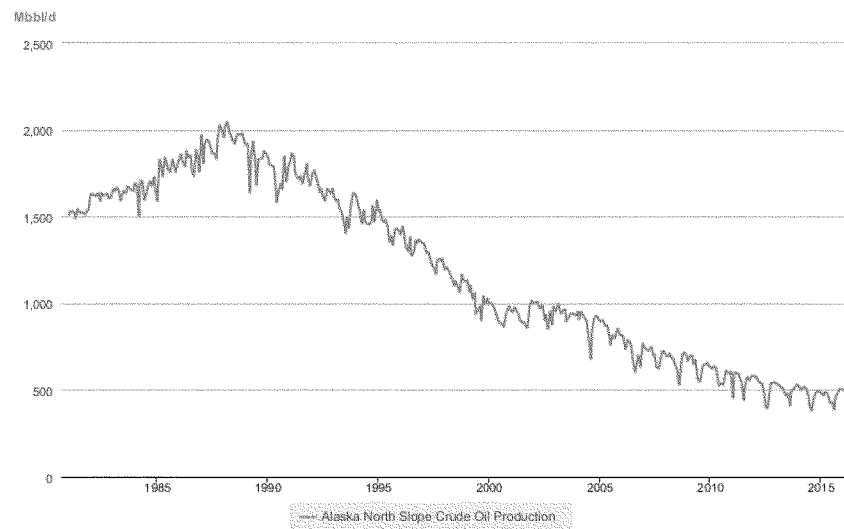
The federal government has implemented energy policies that treat Alaska in exceptional ways. Sometimes this has involved exempting the State from certain nationwide mandates, while in other cases Alaska has been conferred exclusive opportunities. As the North American energy renaissance prompts a broad modernization of U.S. energy policy, Alaska may continue to deserve such special status in other areas.

Acknowledgments

Staff wish to thank the Congressional Research Service for its assistance with this report. The cover image is of the Trans-Alaska Pipeline in the northern Brooks Range.⁹

⁹ Dave Houseknecht (June 20, 2007):
http://gallery.usgs.gov/photos/03_08_2010_bFVi0MLyx6_03_08_2010_16#.Vwal83q_aao.

APPENDIX A:
TAPS and North Slope Production

Crude Oil Production

 Source: U.S. Energy Information Administration

APPENDIX B:
Kenai LNG



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MEMORANDUM

To: Senate Energy and Natural Resources Committee
Attention: Tristan Abbey

From: Michael Ratner, Specialist in Energy Policy

Subject: Kenai LNG export orders

As you requested, below is a table in chronological order of export orders related to the Kenai LNG facility in Alaska.

Table 1. Department of Energy Export Orders Related to Kenai LNG

Order	Order #	Date
Order granting blanket authorization to export liquefied natural gas by vessel from the Kenai LNG facility near Kenai, Alaska, and vacating prior export authorization	3784	February 8, 2016
Order granting blanket authorization to export liquefied natural gas by vessel from the Kenai LNG facility near Kenai, Alaska to non-free trade agreement nations	3418	April 14, 2014
Order granting blanket authorization to export liquefied natural gas by vessel from the Kenai LNG facility to free trade agreement nations	3392	February 19, 2014
Order granting authorization to export liquefied natural gas from Alaska	2860	October 5, 2010
Order denying rehearing	2500-A	July 30, 2008
Order granting authorization to export liquefied natural gas from Alaska	2500	June 3, 2008
Order amending authority to export to reflect name change	261-G, 1473-A, 1580-A	January 30, 2008
Order amending authorization to export liquefied natural gas from Alaska	261-F	June 20, 2000
Order granting blanket authorization to export liquefied natural gas from Alaska	1580	April 10, 2000
Order extending authorization to export liquefied natural gas from Alaska	1473	April 2, 1999
Order dismissing complaint	261-E	July 18, 1997
Order amending authorization to export liquefied natural gas	261-D	March 2, 1995
Order granting blanket authorization to export liquefied natural gas	786	March 17, 1993
Order amending authorization to export liquefied natural gas to Japan	261-C	July 15, 1992
Order transferring authorization to export liquefied natural gas	261-B	December 19, 1991

Order	Order #	Date
Order amending authorization to export liquefied natural gas to Japan	261-A	June 18, 1991
Order amending authorization to export liquefied natural gas to Japan	261	July 28, 1988
Order amending authorization to export liquefied natural gas	206	November 16, 1987
Order transferring the LNG export authorization of Phillips Petroleum Company to Phillips 66 Natural Gas Company	49-A	April 3, 1986
Order amending authorization of Phillips Petroleum Company and Marathon Oil Company to export LNG from Alaska	49	December 14, 1982
Order authorizing exportation of liquefied natural gas and dismissing application for permit	37 FPC 777	April 19, 1967

Source: Department of Energy

APPENDIX C:
Alaska LNG



**Congressional
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Informing the legislative debate since 1914

MEMORANDUM

To: Senate Energy & Natural Resources Committee
Attention: Tristan Abbey

From: Michael Ratner, Specialist in Energy Policy

Subject: Differentiating Alaska natural gas exports

This memorandum responds to your request for information regarding liquefied natural gas (LNG) projects for export in the state of Alaska and how they are treated differently by the Department of Energy's (DOE) Office of Fossil Energy (DOE/FE). If you have any questions or would like to discuss the details of this memorandum please do not hesitate to contact me.

DOE's LNG Exports Determinations and Alaska

DOE/FE has statutory responsibility, through Section 3 of the Natural Gas Act (NGA), to permit the export of natural gas from the United States. Exports to countries with which the United States has a free trade agreement (FTA) are deemed consistent with the public interest and authorization is granted without modification or delay. Exports to non-FTA countries require DOE/FE to make a public interest determination. If DOE/FE finds that the exports are not consistent with the public interest, then authorization is denied. This determination cannot be waived.

As part of its due diligence in response to the large number of applications to export U.S. produced natural gas it received, DOE/FE commissioned two studies regarding LNG exports from the lower-48 states. The studies examined the effects of LNG exports on domestic natural gas prices and the U.S. economy. Neither study included exports from Alaska, in part because no new projects to export natural gas from Alaska were proposed at the time, but also because Alaskan natural gas exports are viewed as unlikely to affect prices and the economy in the lower-48 states. Subsequent DOE/FE studies took the same approach to Alaskan LNG exports. Since those initial studies, the Alaska LNG project (see below "The Alaska LNG Project") has been proposed and treated separately from DOE/FE's analysis of the market implications of natural gas exports from the lower-48 states. The potential export volumes from the Alaska LNG projects are not included in the cumulative economic effects or other effects that DOE is evaluating for projects in the lower-48 states.

The Kenai LNG Terminal: The Only Operating U.S. LNG Export Terminal

Since 1969, Alaska has been the only U.S. state to export natural gas in liquefied form (LNG).¹ The Kenai LNG facility in Nikiski, AK operated continuously from 1969 to 2011, when production of natural gas in

¹ See order by the Federal Power Commission authorizing the exports from the Kenai LNG terminal, <https://www.ferc.gov/industries/gas/indus-act/angtp/37fpc777.pdf>.

the Cook Inlet of Alaska declined too much to keep the facility operating. Subsequent discoveries prompted the owner and operator of the facility, ConocoPhillips, to reopen the terminal in 2012. On March 31, 2013, the export license for the terminal expired. A new request to export was submitted by ConocoPhillips to DOE/FE for a short-term license (two-years), which was granted in April, 2014. The company subsequently applied again for an extension in September 2015, in advance of the expiration of its previous permit in April 2016. The company received its authorization on February 8, 2016. The current DOE/FE authorization, Order No. 3784, grants ConocoPhillips a new license to export LNG from its Kenai facility beginning February 19, 2016 and terminating on February 18, 2018.

The Alaska LNG Project: Bringing North Slope Natural Gas to Market

The Alaska LNG project submitted its application to export natural gas to countries with which the United States does not have an FTA on July 18, 2014.² In Order No. 3643, DOE/FE issued a conditional order granting the project approval to export natural gas to non-FTA countries.³ In the order DOE/FE makes multiple references to Alaskan natural gas exports being different than those from the lower-48 states. In its conclusion, DOE/FE recognizes that “export facilities located in Alaska may present different considerations.”⁴ The Alaska LNG project includes an 800-mile pipeline to transport natural gas from the North Slope to its proposed liquefaction facility in Nikiski (not the existing terminal). According to DOE/FE, because of this distance it views the natural gas intended for export as stranded and that it would not otherwise come to market. According to DOE/FE, the added cost of the pipeline to the project necessitated a conditional authorization for the Alaska LNG project, something it stopped issuing for projects in the lower-48 states. In examining domestic and regional supply, DOE/FE concluded that its “focus in this proceeding is regional.”⁵

In addition to the Natural Gas Act, natural gas exports from Alaska’s North Slope, which is where the Alaska LNG project would source its natural gas, are subject to the Alaska Natural Gas Transportation Act (ANGTA) of 1976 (P.L. 94-586). Section 12 of the law stipulates that “before any Alaska natural gas in excess of 1,000 Mcf [thousand cubic feet] per day may be exported to any nation other than Canada or Mexico, the President must make and publish an express finding that such exports will not diminish the total quantity or quality nor increase the total price of energy available to the United States.” Both the NGA and the ANGTA apply to North Slope natural gas exports. In 1988, President Reagan made a determination that exports of Alaska natural gas from the original Kenai terminal would satisfy the ANGTA requirement based in part on the price of natural gas at the time and the supply. Similar conditions would seem to apply now to the new Nikiski project.

² U.S. Department of Energy, Office of Fossil Energy, *Order Conditionally Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Proposed Alaska LNG Terminal in Nikiski, Alaska, to Non-Free Trade Agreement Nations*, FE Docket No. 14-96-LNG, Washington, DC, May 28, 2015, p. 5, <http://energy.gov/sites/prod/files/2015/07/t24/ord3643.pdf>.

³ When DOE/FE changed its procedures for evaluating U.S. LNG exports and eliminated its conditional approvals for projects, it retained its right to issue conditional approvals for projects in Alaska, and did issue a conditional approval for the Alaska LNG project. See http://energy.gov/sites/prod/files/2014/08/t18/FR%20Procedures%20LNG%20Exports%2008_15_14.pdf for the procedural changes.

⁴ DOE/FE Docket No. 14-96-LNG, page 30.

⁵ DOE/FE Docket No. 14-96-LNG, page 33.

Table 1. Documents Distinguishing Alaskan Natural Gas Exports
Newest to Oldest

Description	Order	Date	Excerpt/Comment
Order granting blanket authorization to export liquefied natural gas by vessel from the Kenai LNG facility near Kenai, Alaska, and vacating prior export authorization ^a	3784	February 8, 2016	"In particular, we (DOE/FE) find that the proposed exports of natural gas are not needed to meet regional demand in the Cook Inlet, Alaska area during the two-year period of this authorization. For these and other reasons discussed below, we grant CPANGC's Application." ^b
Order conditionally granting long-term, multi-contract authorization to export liquefied natural gas by vessel from the proposed Alaska LNG terminal in Nikiski, Alaska, to non-free trade agreement nations ^c	3643	May 28, 2015	"No intervenor challenged this assertion [that the question of general domestic or national need was not relevant], and DOE/FE concurs in it." ^d
Order granting long-term multi-contract authorization to export liquefied natural gas by vessel from the proposed Alaska LNG project in the Nikiski area of the Kenai Peninsula, Alaska, to free trade agreement nations ^c	3554	November 21, 2014	"As to the 12-year period for the commencement of export operations, Alaska LNG notes that construction of the Project will take place in challenging Arctic conditions. Alaska LNG also highlights the complexity and expansive scope of the Project, which it anticipates will lengthen the environmental review and permitting timelines under the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq." ^e DOE/FE granted the 12 year period to begin operations.
Order conditionally granting long-term multi-contract authorization to export liquefied natural gas by vessel from the Freeport LNG terminal on Quintana Island, Texas to non-free trade agreement nations	3282	May 17, 2013	Because there is no natural gas pipeline interconnection between Alaska and the lower 48 states, those LNG export markets generally are viewed as distinct. ^f
Report: <i>Effect of Increased Natural Gas Exports on Domestic Energy Markets</i> by the U.S. Energy Information Administration		January 2012	EIA assumed that an Alaska pipeline, which would transport Alaskan produced natural gas into the lower-48 United States, would not be built during the forecast period in any of the cases in order to isolate the lower-48 United States supply response. Due to this restriction, both the AEO [Annual Energy Outlook] 2011 High Economic Growth and Low Shale EUR [estimated ultimate recovery] cases were rerun, as those cases had the Alaska pipeline entering service during the projection period in the published AEO2011. ^g
Order granting authorization to export liquefied natural gas from Alaska ^a	2860	October 5, 2010	"The standard of review in Order No. 2500, as here, is whether the proposed export is inconsistent with the public interest and, in particular, whether there is a shortage of natural gas supplies in the local Southeastern Alaska market such that local needs for natural gas cannot be met..." ^h

Description	Order	Date	Excerpt/Comment
Order granting authorization to export liquefied natural gas from Alaska ^a	2500	June 3, 2008	"On balance, we [DOE/FE] find that local interests are well served by a grant of the requested authorization because the continued operation of the Applicant's liquefaction plant provides significant benefits to the local economy." ^b
Order extending authorization to export liquefied natural gas from Alaska ^a	1473	April 2, 1999	DOE/FE authorized the extension of exports from Alaska, it evaluated the impact of the exports on a regional basis and did not mention the effect on prices in the lower-48 states. ^j

Source: U.S. Department of Energy and U.S. Energy Information Administration.

Notes:

- a. Refers to the existing Kenai LNG terminal.
- b. p. 2, <http://www.energy.gov/sites/prod/files/2016/02/f29/ord3784.pdf>.
- c. Refers to the proposed terminal in Nikiski.
- d. p. 5, <http://energy.gov/sites/prod/files/2015/07/f24/ord3643.pdf>.
- e. p. 6, <http://energy.gov/sites/prod/files/2014/11/f19/ord3554%20fta.pdf>.
- f. pp. 13-14, <http://energy.gov/sites/prod/files/2013/05/f0/ord3282.pdf>.
- g. p. 3. This study was commissioned by DOE's Office of Fossil Energy as part of their statutory requirements to determine if natural gas exports to non-FTA countries are in the public interest.
- h. p. 16, http://www.fossil.energy.gov/programs/gasregulation/authorizations/Orders_Issued_2010/ord2860.pdf.
- i. p. 57, <http://ferc.gov/industries/gas/indus-act/angtp/doe2500.pdf>.
- j. <http://www.fossil.energy.gov/programs/gasregulation/authorizations/orders/ord1473.pdf>.

APPENDIX D:
National Petroleum Reserve-Alaska



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MEMORANDUM

To: Senate Committee on Energy and Natural Resources
Attention: Tristan Abbey

From: Marc Humphries, Specialist in Energy Policy

Subject: Brief History and Status of the Former Naval Petroleum Reserves

You requested a memorandum on a brief history and status of the former Naval Petroleum Reserves (NPR) beginning with the Naval Petroleum Reserves Production Act of 1976 (P.L. 94-258). The 1976 Act placed the reserves within a production framework rather than for conservation, e.g., the 1976 Act authorized full commercial development of the reserves. The reserves were primarily transferred to and managed by the newly established Department of Energy (DOE) in 1977. There were seven reserves listed under the 1976 Act. No maps of the NPRs are included in this memo, because they were either non-authoritative or inadequate, with the exception of the NPR-A map.

Former NPR's:

NPR-1 Elk Hills

Elk Hills is located in Kern County, near Bakersfield, California, and was one of the largest oil fields in the United States. The DOE was directed to sell off the asset by the Defense Authorization Act of 1996 (P.L. 104-106). NPR-1 was privatized in 1998. Occidental Petroleum Company (OXY) purchased it for \$3.65 billion. The Elk Hills oil field had been in production since 1976. At its peak in 1981, Elk Hills produced 181,000 barrels per day. OXY continues to produce oil and gas at its Elk Hills operation.

NPR-2 Buena Vista

NPR-2 is also in Kern County, California, about 30 miles southwest of Bakersfield. The property was transferred from the Department of Defense (DOD) to DOE following the 1976 Act, then, under the Energy Policy Act of 2005, the property was transferred to the Department of the Interior (DOI). Some of the lands were conveyed to the city of Taft, California. The Bureau of Land Management (BLM)¹ held oil and gas lease sales beginning in 2006 -- the first in about 80 years. The field is currently near exhaustion.

¹ The BLM, an agency within the Department of the Interior, administers the oil and gas leasing program on federal lands, among other things.

NPR-3 Teapot Dome

NPR-3 is located about 25 miles north of Casper, Wyoming. After the 1976 Act, the DOE retained operation of NPR-3 (Teapot Dome), operating a small stripper well and the Rocky Mountain Oilfield Testing Center (RMOTC) until its recent sale to Stranded Oil Resources Corporation on January 30, 2015. The DOE announced its intent to sell the NPR-3 in July 2013. The RMOTC used NPR-3 as a commercial testing ground for new technology and processes for petroleum production.

NPR-4 Alaska

The Naval Petroleum Reserve-Alaska, (NPR-A), located in northwest Alaska, was renamed the National Petroleum Reserve-Alaska and transferred to the DOI following the 1976 Act. The BLM held lease sales in the northeast planning area of the reserve in 1999, 2002, and 2010 and held lease sales in the northwest planning area in 2004 and 2006. In 2008 and 2011, tracts were offered in the northeast and northwest areas. On February 13, 2015, the BLM reached a Record of Decision on a development alternative that would allow the Greater Moose's Tooth One (GMT1) oil and gas project to move forward, potentially reaching production in the far eastern section of the reserve. The GMT1 site would be the first producer in the NPR-A.

In 2012, the Secretary of the Interior (Ken Salazar) announced his decision, based on a multi-year planning process and the Final Integrated Activity Plan/Environmental Impact Statement, to limit oil and gas development to about 12 million acres (or 72% of the reserve's estimated recoverable oil and gas) of the 23 million acre reserve.

Naval Oil Shale Reserve-1 Colorado (NOSR-1) (top of the Roan Plateau) and Naval Oil Shale Reserve-3 Colorado (NOSR-3) (base of the Roan Plateau)

The NOSRs 1 and 3, located in western Colorado near the city of Rifle, were transferred from DOE to the DOI in 1997 under the National Defense Authorization Act of 1997 (P.L. 105-85). Properties were transferred for the purpose of developing their commercial potential within the multiple-use planning framework for federal land use. The Roan Plateau was included in the BLM Resource Management Plan (RMP) in 1984 and within the Roan Plateau Planning Area. Oil and gas lease sales were held beginning in 2008, but currently there is no production in the former NOSR-1 (top of the Roan Plateau). Development was halted as a result of a court challenge. As part of the settlement, the BLM is required to complete a new Environmental Impact Statement which would analyze and possibly adopt the Roan Plateau Settlement.

Several natural gas wells were developed by DOE in the former NOSR-3. Currently, there is significant oil and gas production in the former NOSR-3 (base of the Roan Plateau). The Anvil Points Oil Shale R&D facility which was established at NOSR-3 was decommissioned between 1985-1987.

Naval Oil Shale Reserve-2 Utah (NOSR-2)

The DOE transferred NOSR-2 to the Northern Ute Indian Tribe in 2000. Plans for development are uncertain as a search did not uncover anything specific to the former NOSR site.

APPENDIX E:

Oil Exports from Cook Inlet



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MEMORANDUM

To: Senate Committee on Energy and Natural Resources
Attention: Tristan Abbey

From: Paul Parfomak, Specialist in Energy Policy

Subject: Cook Inlet Oil Exports

This memorandum responds to your request for a brief historical overview of oil exports from Cook Inlet, Alaska.¹ Please let me know if you have additional questions.

Oil Exports from Cook Inlet

Prior to passage of the Consolidated Appropriations Act, 2016 (P.L. 114-113), which generally lifts restrictions on marketing and selling U.S. crude oil to international buyers,² exports of Alaskan crude oil other than those passing through the Trans Alaska Pipeline System (TAPS) were subject to restrictions under the Energy Policy and Conservation Act of 1975 (P.L. 94-163, EPCA). This act required the President to promulgate a rule prohibiting the export of domestic crude oil, generally, but allowed exemptions for exports which the President determines to be consistent with the national interest and the purposes of the act (§103(b)) as further detailed in the **Appendix**. Responsibility for implementing EPCA was delegated by the President to the Secretary of Commerce. Therefore, crude oil export licenses under EPCA were issued by the Bureau of Industry and Security (BIS) within the Department of Commerce.

On November 6, 1985, the Secretary of Commerce determined that the export of crude oil from Alaska's Cook Inlet was consistent with the national interest and the purposes of EPCA. The exemption was granted in part due to the efforts of Alaska's congressional delegation and others to persuade the Reagan Administration that increased oil revenues would spur greater oil development in Alaska in the face of declining production.³ Crude oil production from Cook Inlet state waters at that time was around 40,000 barrels per day (bbl/d), but was declining approximately 15% per year due to a lack of new investment by incumbent oil producers (**Figure 1**).⁴

¹ A more expansive discussion of Alaskan energy exports is available in CRS Report R43753, *U.S. Exports of Crude Oil and Natural Gas: The Case of Alaska*, by Paul W. Parfomak and Ian F. Fergusson.

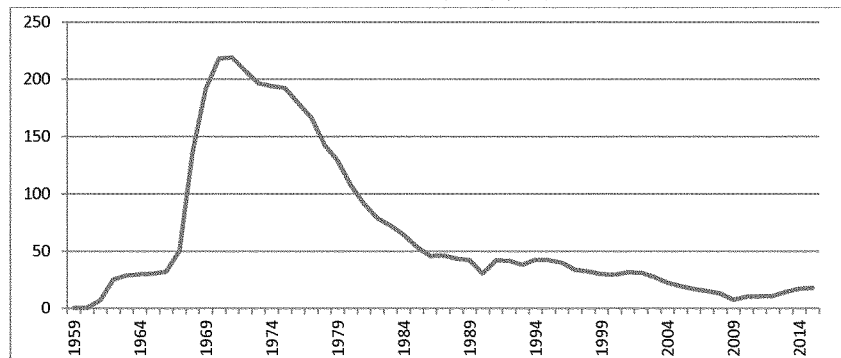
² For further discussion of the act, see CRS Report R44403, *Crude Oil Exports and Related Provisions in P.L. 114-113: In Brief*, by Philip Brown, John Frittelli, and Molly F. Sherlock.

³ Resource Development Council, Inc., "Cook Inlet Oil," *Resource Review*, newsletter, Anchorage, AK, November 1985.

⁴ Department of Commerce, International Trade Administration, "Exports of Crude Oil Derived from Alaska's Cook Inlet," 51 *Federal Register* 20252, June 4, 1986.

Figure 1. Cook Inlet Crude Oil and NGL Production

Thousand barrels per day (bbl/d)



Sources: Alaska Department of Natural Resources, "Royalty Production," web page, April 6, 2016, <http://dog.dnr.alaska.gov/Royalty/Production.htm>; Alaska Department of Revenue, Tax Division, "Alaska Oil Production," November 8, 2013, <http://www.tax.alaska.gov/sourcesbook/AlaskaProduction.pdf>.

Note: NGL = natural gas liquids. NGL exports have not been subject to export restrictions.

In his national interest determination, the Secretary of Commerce addressed Cook Inlet crude oil development.

The benefits that will ensue from these exports include increased incentives for investment in the exploration and development of domestic crude oil, transportation efficiencies, and material enhancements to the energy security of our allies. This initiative will also encourage other countries to remove trade barriers to U.S. goods and services. It does not affect our energy security as we retain the flexibility to react to changes in the world's available oil supply.⁵

BIS license policy for Cook Inlet crude oil exports in the *Code of Federal Regulations* stated:

Exports from Alaska's Cook Inlet. The licensing policy is to approve applications for exports of crude oil that was derived from the state-owned submerged lands of Alaska's Cook Inlet and has not been, or will not be, transported by a pipeline over a federal right-of-way subject to the [Mineral Leasing Act] or the Trans-Alaska Pipeline Authorization Act.⁶

The *Federal Register* notice stated that BIS export licenses issued under these regulations will have a term no longer than one year and are subject to revocation "if there is serious interruption to available U.S. oil supplies."⁷ According to the BIS, the agency approved a total of six licenses for the export of Cook Inlet oil in fiscal years 1986, 1987 (2), 1989 (2), and 1990.⁸

The state of Alaska receives royalties of approximately 12.5% of the oil and natural gas produced from its leases. These royalties may be taken as a share of the physical commodity—royalties "in-kind" (RIK)—or as a share of commodity value. According to the Alaska Department of Natural Resources, the state

⁵ Ibid.

⁶ 15 C.F.R. 754.2 (d).

⁷ Department of Commerce, "Exports of Crude Oil Derived from Alaska's Cook Inlet," 50 *Federal Register* 52798, December 26, 1985.

⁸ Bureau of Industry and Security, personal communication, September 8, 2014.

began exporting its RIK oil from the Cook Inlet to Taiwan in 1987. Exports to Taiwan continued through a series of one-year competitive auctions until 1991, when the last contracted deliveries were stopped under *force majeure* following the eruption of the Mount Redoubt volcano, which disrupted oil operations in the Cook Inlet area.⁹ The total volume of RIK Cook Inlet crude oil exported to Taiwan between 1987 and 1991 was 3,587,088 barrels.¹⁰ These exports never resumed. The exports by the state of Alaska correspond with the BIS licenses issued and appear to account for all oil exports from Cook Inlet. As **Figure 1** shows, while Cook Inlet exports may have temporarily increased crude production, they did little to reverse the long-term decline of crude oil production in the region. Today, nearly all crude oil produced in Cook Inlet is supplied to a refinery near the city of Kenai, AK, which produces most of Alaska's gasoline as well as other fuels.¹¹

⁹ Alaska Department of Natural Resources, *Division of Oil and Gas 2009 Annual Report*, May 2010, p. 36, http://dog.dnr.alaska.gov/Publications/Documents/AnnualReports/Section2_2009.pdf.

¹⁰ *Ibid.*, Table II.8.

¹¹ Alaska Oil and Gas Association, "AOGA Fact Sheet: Cook Inlet Oil & Gas Production," April 2015, p. 3.

Appendix: Prior Statutory Limits on Cook Inlet Exports

Energy Policy and Conservation Act of 1975 (P.L. 94-163 §103)

DOMESTIC USE OF ENERGY SUPPLIES AND RELATED MATERIALS AND EQUIPMENT

SEC. 103. (a) The President may, by rule, under such terms and conditions as he determines to be appropriate and necessary to carry out the purposes of this Act, restrict exports of—

- (1) coal, petroleum products, natural gas, or petrochemical feedstocks, and
 - (2) supplies of materials or equipment which he determines to be necessary (A) to maintain or further exploration, production, refining, or transportation of energy supplies, or (B) for the construction or maintenance of energy facilities within the United States.
- (b) (1) The President shall exercise the authority provided for in Exemption, subsection (a) to promulgate a rule prohibiting the export of crude oil and natural gas produced in the United States, except that the President may, pursuant to paragraph (2), exempt from such prohibition such crude oil or natural gas exports which he determines to be consistent with the national interest and the purposes of this Act.
- (2) Exemptions from any rule prohibiting crude oil or natural gas exports shall be included in such rule or provided for in an amendment thereto and may be based on the purpose for export, class of seller or purchaser, country of destination, or any other reasonable classification or basis as the President determines to be appropriate and consistent with the national interest and the purposes of this Act.
- (c) In order to implement any rule promulgated under subsection (a) of this section, the President may request and, if so, the Secretary of Commerce shall, pursuant to the procedures established by the Export Administration Act of 1969 (but without regard to the phrase “and to reduce the serious inflationary impact of foreign demand” in section 3(2)(A) of such Act), impose such restrictions as specified in any rule under subsection (a) on exports of coal, petroleum products, natural gas, or petrochemical feedstocks, and such supplies of materials and equipment.
- (d) Any finding by the President pursuant to subsection (a) or (b) and any action taken by the Secretary of Commerce pursuant thereto shall take into account the national interest as related to the need to leave uninterrupted or unimpaired—
- (1) exchanges in similar quantity for convenience or increased efficiency of transportation with persons or the government of a foreign state,
 - (2) temporary exports for convenience or increased efficiency of transportation across parts of an adjacent foreign state which exports reenter the United States, and
 - (3) the historical trading relations of the United States with Canada and Mexico....

APPENDIX F:
TAPS/Canada Oil Exports



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MEMORANDUM

To: Senate Committee on Energy and Natural Resources
Attention: Tristan Abbey

From: Paul Parfomak, Specialist in Energy Policy

Subject: Alaska Oil Exports to Canada Under Free Trade Agreements

This memorandum responds to your request for a brief historical overview of oil exports from Alaska to Canada under free trade agreements.¹ Please let me know if you have additional questions.

Alaska Oil Exports under USCFTA and NAFTA

The United States-Canada Free-Trade Agreement Implementation Act of 1988 (USCFTA)² authorized exports of up to 50,000 barrels per day (bbl/d)³ of Trans Alaska Pipeline System (TAPS) crude oil to Canada—as provided for in the agreement⁴—subject to certain presidential findings and on condition that the oil be shipped on U.S.-flagged tankers from the lower 48 states and consumed in Canada.⁵ It appears that access to TAPS oil was a Canadian request, based on the needs of Vancouver refineries. Canada sought this reciprocal access for its acquiescence to essentially guarantee a supply of oil and gas to the United States under the USCFTA energy chapter. It was noted that 50,000 bbl/d was only 2-3% of total Alaskan daily output in 1988.⁶ To implement this provision of the agreement, on December 31, 1988, President Reagan issued a finding that crude oil exports under USCFTA were in the national interest.⁷ According to the Alaska Department of Natural Resources, however, there were no shipments of TAPS crude to Canada under this authorization.⁸

¹ A more expansive discussion of Alaskan energy exports is available in CRS Report R43753, *U.S. Exports of Crude Oil and Natural Gas: The Case of Alaska*, by Paul W. Parfomak and Ian F. Fergusson.

² P.L. 100-449 §305(a).

³ While an explanation of the precise figure of 50,000 bbl/d may be lost to history, it appears to have been related to the refinery capacity in Vancouver where it was presumed by Alaska officials the oil would be shipped.

⁴ USCFTA, Annex 902.5(3)

⁵ P.L. 100-449 §305(a).

⁶ “Energy: Free Trade with Canada,” Hearings before the Subcommittee on Energy and Power, Committee on Energy and Commerce, March 1, 1988, Serial No. 100-179. p. 4.

⁷ President Ronald Reagan, “Presidential Findings Regarding the Export of Alaskan Crude Oil to Canada,” December 31, 1988.

⁸ Alaska Department of Natural Resources, personal communication, September 18, 2014.

The TAPS oil export provisions of the USCFTA were incorporated by reference in the North American Free Trade Agreement (NAFTA), which went into effect on January 1, 1994.⁹ However, the regulatory record raises the question of whether the 1996 determination allowing unlimited exports from TAPS was in conflict with the earlier 1988 determination with regard to Canada. It could be argued that—as the superseding language—the 1996 determination did extend to Canada as the language is not country specific. Nonetheless, the 1988 determination capping the amount at 50,000 bbl/d was also still reflected in the BIS export regulations. Because Canada apparently never imported U.S. crude oil under the specific provisions related to TAPS it is unclear whether the two seemingly different allowances represented an oversight in regulatory codification or the licensing policy at the time.

Lifting of U.S. Crude Oil Export Restrictions

On December 18, 2015, Congress passed the Consolidated Appropriations Act, 2016 (H.R. 2029), which was signed by the President and became P.L. 114-113.¹⁰ Included in P.L. 114-113 is a provision that repeals Section 103 of the Energy Policy and Conservation Act of 1975 (EPCA; P.L. 94-163), which directs the President to promulgate a rule prohibiting crude oil exports. P.L. 114-113 also includes a “savings clause” and a list of exceptions that maintain and provide the President with authority to restrict exports under certain circumstances. Enactment of P.L. 114-113 allows U.S. crude oil to be marketed and sold to international buyers and concludes a nearly two-year debate about the varied and multi-dimensional considerations associated with allowing the export of crude oil produced in the United States. Passage of P.L. 114-113 appears to have removed any USCFTA or NAFTA restrictions on TAPS oil export from Alaska to Canada. However, CRS is not aware of any crude oil shipments from TAPS to Canada since the act was passed.

⁹ NAFTA, Annex 608.2

¹⁰ For further discussion, see CRS Report R44403, *Crude Oil Exports and Related Provisions in P.L. 114-113: In Brief*, by Philip Brown, John Frittelli, and Molly F. Sherlock.

APPENDIX G:
Oil Exports from TAPS



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MEMORANDUM

To: Senate Committee on Energy and Natural Resources
Attention: Tristan Abbey

From: Paul Parfomak, Specialist in Energy Policy

Subject: Alaska North Slope Oil Exports

This memorandum responds to your request for a brief historical overview of oil exports from Alaska's North Slope.¹ Please let me know if you have additional questions.

North Slope Oil Exports

The export of crude oil from Alaska's North Slope (ANS) has been an issue for Congress since the authorization of the Trans Alaska Pipeline System (TAPS) in 1973. The Trans Alaska Pipeline Authorization Act² specified that oil shipped through the pipeline could be exported internationally, but only under restrictive conditions (detailed in the **Appendix**) including a finding by the President that such exports would be in the national interest. These conditions were reaffirmed in the Export Administration Act of 1979.³ In effect, the conditions amounted to a ban on TAPS oil exports.

TAPS was completed in 1977; initial oil shipments were flowing by year-end. With continued oilfield development on the North Slope, production climbed steadily for 10 years, peaking at nearly 2 million barrels per day (bbl/d) in 1988 (**Figure 1**). Much of the North Slope crude was shipped to California for refining, which was the nation's third-largest oil producer at the time.

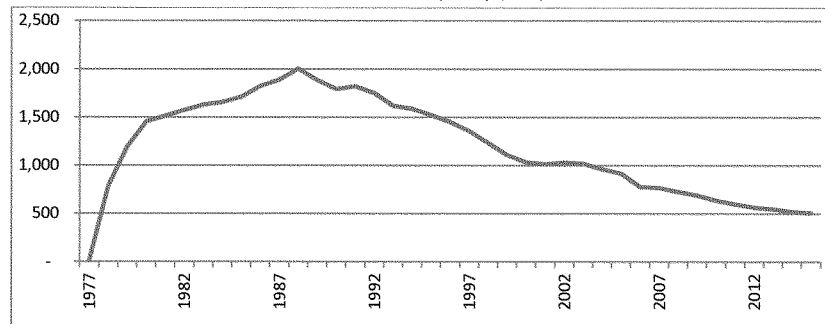
¹ A more expansive discussion of Alaskan energy exports is available in CRS Report R43753, *U.S. Exports of Crude Oil and Natural Gas: The Case of Alaska*, by Paul W. Parfomak and Ian F. Fergusson.

² P.L. 93-153, 43 U.S.C. §§1651 et seq.

³ P.L. 108-458 §7(d).

Figure 1. Alaska North Slope Crude Oil Production

Thousand barrels per day (bbl/d)



Sources: Alaska Department of Natural Resources, "Royalty Production," web page, April 6, 2016, <http://dog.dnr.alaska.gov/Royalty/Production.htm>; Alaska Department of Revenue, Tax Division, "Alaska Oil Production," November 8, 2013, <http://www.tax.alaska.gov/sourcesbook/AlaskaProduction.pdf>.

The United States-Canada Free-Trade Agreement Implementation Act of 1988 (USCFTA)⁴ authorized exports of up to 50,000 bbl/d⁵ of TAPS crude oil to Canada—as provided for in the agreement⁶—subject to certain presidential findings and on condition that the oil be shipped on U.S.-flagged tankers from the lower 48 states and consumed in Canada.⁷ It appears that access to TAPS oil was a Canadian request, based on the needs of Vancouver refineries. Lacking access to TAPS crude, Canadian refiners on the west coast had to source their oil feedstock from more expensive Asian or Middle Eastern suppliers. Canada sought this reciprocal access for its acquiescence to essentially guarantee a supply of oil and gas to the United States under the USCFTA energy chapter. It was noted that 50,000 bbl/d was only 2-3% of total Alaskan daily output in 1988.⁸ To implement this provision of the agreement, on December 31, 1988, President Reagan issued a finding that crude oil exports under USCFTA were in the national interest.⁹ According to the Alaska Department of Natural Resources (ADNR), however, there were no shipments of TAPS crude to Canada under this authorization.¹⁰

In the mid-1990s, high volumes of Alaskan oil could be shipped economically only to the four western states.¹¹ This resulted in locally falling oil prices and constrained domestic production.¹² As California prices fell below world prices, there were complaints from West Coast oil producers, industry analysts,

⁴ P.L. 100-449 §305(a).

⁵ While an explanation of the precise figure of 50,000 bbl/d may be lost to history, it appears to have been related to the refinery capacity in Vancouver where it was presumed by Alaska officials the oil would be shipped.

⁶ USCFTA, Annex 902.5(3)

⁷ P.L. 100-449 §305(a).

⁸ "Energy: Free Trade with Canada," Hearings before the Subcommittee on Energy and Power, Committee on Energy and Commerce, March 1, 1988, Serial No. 100-179, p. 4.

⁹ President Ronald Reagan, "Presidential Findings Regarding the Export of Alaskan Crude Oil to Canada," December 31, 1988.

¹⁰ Alaska Department of Natural Resources, personal communication, September 18, 2014.

¹¹ Very minor amounts also went through the Panama Canal to U.S. refineries on the Gulf of Mexico.

¹² See, for example: Samuel A. Van Vactor, "Time to End the Alaskan Oil Export Ban," Cato Policy Analysis No. 227, Cato Institute, May 18, 1995, <http://www.cato.org/pubs/pas/pa-227.html>.

and public officials about what they perceived to be artificially depressed prices. Some also pointed to the underutilization of tankers built to carry North Slope crude, and the resulting negative impacts on marine employment, shipbuilding and repair, and the availability of tankers for national defense.¹³

Early efforts to achieve remedial action failed until 1995, when low world oil prices and a supportive Department of Energy (DOE) coincided with renewed legislative efforts in both Houses of Congress. A June 1994 DOE study, *Exporting Alaskan North Slope Crude Oil—Benefits and Costs*, concluded that permitting the export of Alaska crude would be beneficial to the U.S. economy.

First, lifting the ban would expand the markets in which ANS oil can be sold, thereby increasing its value. ANS oil producers, the States of California and Alaska, and some of their local governments all would benefit from increased revenues. Permitting exports also would generate new economic activity and employment in California and Alaska. The study concludes that these economic benefits would be achieved without increasing gasoline prices (either in California or in the nation as a whole).¹⁴

Increased producer revenues would be the result of access to a broader market as well as transportation savings from avoiding the Panama Canal to reach U.S. ports in the Gulf of Mexico. In addition, DOE predicted that higher prices at the wellhead would result in 100,000 bbl/d more output from Alaska and California than would be the case with continued export restriction. Higher North Slope production, in turn, would generate additional income to the federal government due to oil sales from federally owned reserves and royalties on federal leases. Royalty revenues to the state of Alaska would likewise increase.

Original opposition to the export of crude oil from TAPS was driven in part by representatives of the U.S. maritime industry, who viewed Alaskan oil development as an opportunity to enlarge the U.S.-flagged coastal tanker fleet under the Merchant Marine Act of 1920 (the Jones Act).¹⁵ The Jones Act requires shipments between U.S. ports to be carried on U.S.-flagged vessels. More recent opponents of exports from TAPS argued that such exports would increase U.S. dependence upon foreign oil supplies, raise gasoline prices, and lead to job losses at West Coast refineries no longer being supplied with Alaskan oil. Some opponents also expressed concerns about potential oil spills (in light of the *Exxon Valdez* spill) or linked TAPS oil exports to potential oil exploration in Alaska's Arctic National Wildlife Refuge, an environmentally sensitive area they wished to protect from development.¹⁶

Notwithstanding the arguments of opponents, and with substantial projected economic benefits (and little administrative cost), bills to repeal the effective export ban in the 104th Congress (H.R. 70 and S. 395) passed by large margins, 324-77 and 74-25 respectively.¹⁷ President Clinton signed the Trans-Alaska Pipeline Amendment Act (P.L. 104-58) in November 1995. The act provides that oil transported through TAPS may be exported unless the President finds, after considering specified criteria, that exports are not in the national interest.¹⁸

¹³ U.S. Congress, House Committee on Resources, *Exports of Alaskan North Slope Oil*, To Accompany H.R. 70, 104th Cong., 1st sess., June 15, 1995, H.Rept. 104-139 (Washington: GPO, 1995).

¹⁴ Department of Energy, *Exporting Alaskan North Slope Crude Oil—Benefits and Costs*, June 1994, p. 1.

¹⁵ Samuel A. Van Vactor, May 18, 1995. For further discussion see CRS Report R43653, *Shipping U.S. Crude Oil by Water: Vessel Flag Requirements and Safety Issues*, by John Frittelli.

¹⁶ "Alaska Oil Export Ban Lifted," *CQ Almanac*, 1995, 51st ed., pp. 5-25-5-26, 1996.

¹⁷ While the export ban was under debate in 1995, the United States was already exporting nearly 900,000 bbl/d of petroleum products—28% in the form of petroleum coke, which is used in making steel. Other exports were cross-border exchanges of refined products, as well as some crude, with Canada and Mexico. Trade in petroleum coke plus exports to Canada and Mexico accounted for 69% of all U.S. oil exports at the time.

¹⁸ Trans-Alaska Pipeline Amendment Act of 1995, P.L. 104-58, 30 U.S.C. §185(s).

To address the economic and environmental issues associated with TAPS oil exports, the National Economic Council, the Council on Environmental Quality, and the Department of Commerce's Bureau of Export Administration coordinated an interagency review. The review—which included extensive public hearings, review of public comments, and analytical evaluation—concluded that TAPS exports would not likely pose a significant impact to the economy or the environment.¹⁹ Subsequently, on April 28, 1996, President Clinton issued a national interest determination authorizing North Slope oil exports. The President's determination stated that such exports

will not diminish the total quantity or quality of petroleum available to the United States; and are not likely to cause sustained material oil supply shortages or sustained oil price increases significantly above world market levels that would cause sustained material adverse employment effects in the United States or that would cause substantial harm to consumers.... I have also ... concluded that exports of such crude oil will not pose significant risks to the environment if certain terms and conditions are met.²⁰

The oil export authorization included several conditions related to tanker shipping routes, inspections, and ballast exchange intended to mitigate environmental risk.

With the crude oil export restrictions lifted, TAPS exports totaling 36,000 bbl/d began in 1996; they grew to 66,500 bbl/d in 1997, dipped to 52,900 bbl/d in 1998, and rose again to a high of 74,000 bbl/d in 1999—about 7% of North Slope production that year. According to the Energy Information Administration (EIA), Alaskan crude oil exports between 1996 and 2004 were shipped to South Korea (48%), Japan (26%), China (17%), and Taiwan (9%).²¹ TAPS exports ceased temporarily in May 2000 as West Coast buyers had to pay more to compete with foreign buyers for Alaskan oil. An additional cargo was shipped to China in 2004 aboard a tanker reportedly en route to Asia for repairs.²² TAPS exports resumed with two shipments of crude oil in October 2014 and May 2015 bound for a refinery in South Korea.²³

Viewed relative to total domestic refinery input of 14.8 million bbl/d,²⁴ TAPS crude oil exports at their peak in 1999 amounted to the equivalent of half of one percent of U.S. refinery demand. In absolute terms, these export volumes were not viewed by market analysts as particularly significant. In a July 1999 report, the General Accounting Office (GAO)²⁵ concluded that lifting the North Slope oil export effective ban raised the relative prices of North Slope and comparable California oils between \$0.98 and \$1.30 per barrel above what they would have been with the effective ban in place, but that the price increases did not have an observable effect on North Slope or California oil production. (It is possible that production could have been lower without the incremental demand for exports.) The GAO also concluded that lifting the export ban increased costs for some refiners but had limited effects on consumers and the oil-shipping industry on the West Coast.²⁶

¹⁹ Department of Commerce, Bureau of Export Administration, "Exports of Alaskan North Slope Crude Oil; Establishment of License Exception TAPS," 61 *Federal Register* 27255, May 31, 1996.

²⁰ President William J. Clinton, Memorandum to the Secretary of Commerce and the Secretary of Energy, April 28, 1996.

²¹ Energy Information Administration, "How Much Oil Is Produced in Alaska and Where Does It Go?," web page, June 26, 2014, <http://www.eia.gov/tools/faqs/faq.cfm?id=35&t=6>

²² Warren Cornwall, "Where Would ANWR Oil Go?" *The Seattle Times*, April 19, 2005.

²³ Jacob Gronholt-Pedersen and Liz Hampton, "Traders Eye Alaskan Oil Exports to Asia as Shipping Ban Ended," Reuters, January 8, 2016.

²⁴ Energy Information Administration, "U.S. Refinery and Blender Net Input of Crude Oil," web page, September 29, 2014, <http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRRIUS1&f=A>.

²⁵ Now called the Government Accountability Office.

²⁶ General Accounting Office, *Alaskan North Slope Oil: Limited Effects of Lifting Export Ban on Oil and Shipping Industries and Consumers*, GAO/RCED-99-191, July 1999.

Appendix: Statutory Limits on TAPS Oil Exports

Trans Alaska Pipeline Authorization Act of 1973 (P.L. 93-153 §101)

Limitations on Export

(u) Any domestically produced crude oil transported by pipeline over rights-of-way granted pursuant to section 28 of the Mineral Leasing Act of 1920, except such crude oil which is either exchanged in similar quantity for convenience or increased efficiency of transportation with persons or the government of an adjacent foreign state, or which is temporarily exported for convenience or increased efficiency of transportation across parts of an adjacent foreign state and reenters the United States, shall be subject to all of the limitations and licensing requirements of the Export Administration Act of 1969 (Act of December 30, 1969; 83 Stat. 841) and, in addition, before any crude oil subject to this section may be exported under the limitations and licensing requirements and penalty and enforcement provisions of the Export Administration Act of 1969 the President must make and publish an express finding that such exports will not diminish the total quantity or quality of petroleum available to the United States, and are in the national interest and are in accord with the provisions of the Export Administration Act of 1969; *Provided*, That the President shall submit reports to the Congress containing findings made under this section, and after the date of receipt of such report Congress shall have a period of sixty calendar days, thirty days of which Congress must have been in session, to consider whether exports under the terms of this section are in the national interest. If the Congress within this time period passes a concurrent resolution of disapproval stating disagreement with the President's finding concerning the national interest, further exports made pursuant to the aforementioned Presidential findings shall cease. (P.L. 93-153 § 101)

Export Administration Act of 1979 (P.L. 108-458 §7(d))

(d) DOMESTICALLY PRODUCED CRUDE OIL.—(1) Notwithstanding any other provision of this Act and notwithstanding subsection (u) of section 28 of the Mineral Leasing Act of 1920 (30 U.S.C. 185), no domestically produced crude oil transported by pipeline over right-of-way granted pursuant to section 203 of the Trans-Alaska Pipeline Authorization Act (43 U.S.C. 1652) (except any such crude oil which (A) is exported to an adjacent foreign country to be refined and consumed therein in exchange for the same quantity of crude oil being exported from that country to the United States; such exchange must result through convenience or increased efficiency of transportation in lower prices for consumers of petroleum products in the United States as described in paragraph (2)(A)(ii) of this subsection, (B) is temporarily exported for convenience or increased efficiency of transportation across parts of an adjacent foreign country and reenters the United States, or (C) is transported to Canada, to be consumed therein, in amounts not to exceed an annual average of 50,000 barrels per day, in addition to exports under subparagraphs (A) and (B), except that any ocean transportation of such oil shall be by vessels documented under section 12106 of title 46, United States Code) may be exported from the United States, or any of its territories and possessions, subject to paragraph (2) of this subsection.

(2) Crude oil subject to the prohibition contained in paragraph (1) may be exported only if—

(A) the President so recommends to the Congress after making and publishing express findings that exports of such crude oil, including exchanges—

(i) will not diminish the total quantity or quality of petroleum refined within, stored within, or legally committed to be transported to and sold within the United States;

(ii) will, within 3 months following the initiation of such exports or exchanges, result in (I) acquisition costs to the refiners which purchase the imported crude oil being lower than the acquisition costs such refiners would have to pay for the domestically produced oil in the absence of such an export or exchange, and (II) not less than 75 percent of such

savings in costs being reflected in wholesale and retail prices of products refined from such imported crude oil;

(iii) will be made only pursuant to contracts which may be terminated if the crude oil suppliers of the United States are interrupted, threatened, or diminished;

(iv) are clearly necessary to protect the national interest; and

(v) are in accordance with the provisions of this Act; and

(B) the President includes such findings in his recommendation to the Congress and the Congress, within 60 days after receiving that recommendation, agrees to a joint resolution which approves such exports on the basis of those findings, and which is thereafter enacted into law.

(3) Notwithstanding any other provision of this section or any other provision of law, including subsection (u) of section 28 of the Mineral Leasing Act of 1920, the President may export oil to any country pursuant to a bilateral international oil supply agreement entered into by the United States with such nation before June 25, 1979, or to any country pursuant to the International Emergency Oil Sharing Plan of the International Energy Agency.

Trans-Alaska Pipeline Amendment Act of 1995 (P.L. 104-58 §202)

(f) Exports of Alaskan North Slope Oil—

(1) Subject to paragraphs (2) through (6), of this subsection and notwithstanding any other provision of law (including any regulation), any oil transported by pipeline over right-of-way granted pursuant to this section may be exported after October 31, 1995 unless the President finds that exportation of this oil is not in the national interest. In evaluating whether the proposed exportation is in the national interest, the President—

(A) shall determine whether the proposed exportation would diminish the total quantity or quality of petroleum available to the United States;

(B) shall conduct and complete an appropriate environmental review of the proposed exportation, including consideration of appropriate measures to mitigate any potential adverse effect on the environment, within four months after the date of enactment of this subsection; and

(C) shall consider, after consultation with the Attorney General and Secretary of Commerce, whether anticompetitive activity by a person exporting crude oil under authority of this subsection is likely to cause sustained material crude oil supply shortages or sustained crude oil prices significantly above world market levels for independent refiners that would cause sustained material adverse employment effects in the United States.

The President shall make his national interest determination within five months after the date of enactment of this subsection or 30 days after completion of the environmental review, whichever is earlier. The President may make his determination subject to such terms and conditions (other than a volume limitation) as are necessary or appropriate to ensure that the exportation is consistent with the national interest.

(2) Except in the case of oil exported to a country pursuant to a bilateral international oil supply agreement entered into by the United States with the country before June 25, 1979, or to a country pursuant to the International Emergency Oil Sharing Plan of the International Energy Agency, any oil transported by pipeline over right-of-way granted pursuant to this section, shall, when exported, be transported by a vessel documented under the laws of the United States and owned by a citizen of the United States (as determined in accordance with section 2 of the Shipping Act, 1916 (46 U.S.C. App. 802)).

(3) Nothing in this subsection shall restrict the authority of the President under the Constitution, the International Emergency Economic Powers Act (50 U.S.C. 1701 et seq.), or the National Emergencies Act (50 U.S.C. 1601 et seq.) to prohibit exportation of the oil.

(4) The Secretary of Commerce shall issue any rules necessary for implementation, including any licensing requirements and conditions, of the President's national interest determination within 30 days of the date of such determination by the President. The Secretary of Commerce shall consult with the Secretary of Energy in administering the provisions of this subsection.

(5) If the Secretary of Commerce finds that anticompetitive activity by a person exporting crude oil under authority of this subsection has caused sustained material crude oil supply shortages or sustained crude oil prices significantly above world market levels and further finds that these supply shortages or price increases have caused sustained material adverse employment effects in the United States, the Secretary of Commerce may recommend to the President who may take appropriate action against such person, which may include modification or revocation of the authorization to export crude oil.

(6) Administrative action with respect to an authorization under this subsection is not subject to sections 551 and 553 through 559 of title 5, United States Code.

APPENDIX H:
Renewable Fuel Standard



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MEMORANDUM

To: Senate Committee on Energy and Natural Resources
Attention: Tristan Abbey

From: Kelsi Bracmort, Specialist in Agricultural Conservation and Natural Resources Policy

Subject: The Renewable Fuel Standard: Alaska's Exemption

This memorandum responds to your request for information about Alaska's exemption from the RFS. More specifically, the memorandum provides information on the origination of the exemption, and the arguments made at the time of enactment for and against this exemption.

For additional information or follow up questions, please contact Kelsi Bracmort at 7-7283 (kbracmort@crs.loc.gov).¹

Exemption from the Renewable Fuel Standard

The Renewable Fuel Standard (RFS)—established by the Energy Policy Act of 2005 (P.L. 109-58; EPA05) and expanded in 2007 by the Energy Independence and Security Act (P.L. 110-140; EISA)—mandates that U.S. transportation fuel contain a minimum volume of biofuel.² The statute exempts noncontiguous states and territories, but allows them to opt in.³ The statutory language for the exemption originates from the 108th Congress, when during a Senate Environment and Public Works Committee markup for S. 791, Senator Murkowski offered an amendment by voice vote that would exempt Alaska and Hawaii from ethanol requirements due to the high costs of fuel transportation.⁴ The amendment was opposed by some, including both Senators from California.⁵ Then, in the 109th Congress, during Senate

¹ Reference material for this memorandum was obtained by Laura Hanson, CRS Senior Research Librarian.

² For more information on the RFS, see CRS Report R43325, *The Renewable Fuel Standard (RFS): In Brief*.

³ 42 USC 7545 (o)(2)(A)(ii). For instance, Hawaii petitioned EPA on June 22, 2007, to opt in to the RFS program, and EPA approved its request on July 30, 2007. U.S. Environmental Protection Agency, "Renewable Fuel Standard Under Section 211(o) of the Clean Air Act as Amended by the Energy Policy Act of 2005," 72 *Federal Register* 66172, November 27, 2007. See the attached petition and the approval letter provided by the Environmental Protection Agency (EPA) to CRS on March 17, 2016.

⁴ U.S. Congress, Senate Committee on Environment and Public Works, *Reliable Fuels Act*, Report 108-57, 108th Cong., 1st sess., June 3, 2003, p. 22. CRS found no statement in official sources quoting Senator Murkowski herself discussing the amendment. Local press reported that Senator Murkowski said the following, "... the ethanol requirement would make Alaska gas more expensive by 2 to 5 cents per gallon. And she said it is impractical, given the state's remoteness, to add ethanol." "Senator Murkowski gets ethanol exemption for Alaska," *The Associated Press State & Local Wire*, April 13, 2003.

⁵ "[Senator Boxer] I am also opposed to the amendment added during Committee consideration of the bill to exempt from the ethanol mandate two States, Alaska and Hawaii. We have had no explanation of why an exemption is needed for Alaska and Hawaii and not for other States except some vague claims that the transportation costs will be too high and that these areas do not need ethanol to meet Clean Air Act requirements. However, these same arguments apply to many areas of the county, including (continued...)"

consideration of H.R. 6 (the enacted bill of EPAct 2005) an amendment was added in the Senate with language exempting noncontiguous states and territories.⁶ That language was then retained in conference. For EISA, the exemption language first appeared in H.R. 6 (110th Congress; the enacted bill) during Senate consideration.⁷ Following passage, subsequent versions of the bill retained the exemption.

Argument For and Against the RFS Exemption Language

Congress debated several aspects of the RFS before voting on it, including whether certain states should be exempt from the program. The impetus for this state exemption dialogue was that the majority of the renewable fuel considered to be eligible for the RFS (i.e., corn ethanol)—past and future—is produced in the Midwest, away from major distribution and use centers along the east and west coasts (i.e., midwest state production versus coastal state consumption). Arguments stemmed primarily from economic and transportation concerns. For instance, some were concerned that fuel prices could spike if transport of the renewable fuel from its point of production to the point of consumption took too long.⁸ Additionally, there were concerns about the high cost of transporting ethanol. Moreover, some argued that the RFS would increase gas prices in non-corn growing states, essentially becoming a “hidden gas tax.”⁹ The chemical composition of ethanol prevents it from being transported using existing gasoline pipeline infrastructure. Ethanol is mostly transported by rail car, followed by trucks and barges. Others were concerned that the mandate could give an economic boost to ethanol producers in corn-growing states without giving the same boost to non-corn growing states.¹⁰ Various amendments regarding state participation were

(...continued)

my State of California. My State also will face high shipping and transportation costs. Also, as noted in EPA’s 1999 Blue Ribbon Panel Report on Oxygenates in Gasoline, California does not need ethanol to meet its Clean Air Act requirements.

It has also been argued that the waiver is needed because Alaska and Hawaii do not need as much ethanol as they will be required to use. Again, the same argument can be made for other States. And when those States have raised this concern, the authors of the bill respond by pointing out that the bill gives States credits that they can sell to other States that may need them, thus generating revenue for their States. If this argument is good for some States, it should also be good for all States.

If the costs of implementation and the need for ethanol in a State are to be factors in determining whether the mandate should apply, they should be factors in making a similar determination for all States, not just two. Further, although Alaska and Hawaii would no longer be required to use renewable fuels under this provision, the amount of the national mandate has not decreased accordingly. The mandate in this bill was designed taking all States into account, including Alaska and Hawaii. Now that Alaska and Hawaii are exempt from the mandate, other States will be forced to use greater amounts of ethanol to meet the overall renewable fuels requirements.

This is an unfair and unnecessary exemption for two States, and I oppose it.”

U.S. Congress, Senate Committee on Environment and Public Works, *Reliable Fuels Act*, Report 108-57, 108th Cong., 1st sess., June 3, 2003, p. 41;

“[Senator Feinstein] In the Environment and Public Works Committee, Senator Murkowski offered an amendment to the ethanol mandate to exempt Alaska and Hawaii from the requirement because, first, Alaska and Hawaii are a great distance from the Midwest, where 99 percent of the ethanol is produced in the United States; secondly, families and businesses in Alaska and Hawaii would have to pay exorbitant costs for ethanol to be shipped to these States and blended into their gasoline.

I have the same concerns about increased fuel costs to families and businesses in California if the ethanol mandate becomes law. I am sure other Senators up and down the east and west coasts have the same concerns I do.”

149 Cong Rec S7200. Senate Amdts. 843 and 844 to SA 539 – Energy Policy Act of 2003, June 3, 2003, p. S7205.

⁶ 109th Congress, HR 6 - Senate Engrossed Amendment, June 28, 2005, p. 143.

⁷ 110th Congress, HR 6 - Senate Engrossed Amendment, June 21, 2007, p. 12.

⁸ “Ethanol imports from other regions are vital. However, any potential price spike could be exacerbated if it takes too long for supplies from out-of-State (primarily the Midwest, where virtually all of the production capacity is located).” Senator Feinstein, 149 Cong Rec S7200. Senate Amdts. 843 and 844 to SA 539 – Energy Policy Act of 2003.

⁹ “Senate Postpones Votes on Ethanol Mandate in Energy Bill,” *CQ Today*, May 8, 2003; “East, West Coast Lawmakers to Fight Ethanol Amendment to Energy Measure,” *CQ Today*, May 9, 2003.

¹⁰ This led to the adoption of an amendment by Senator Boxer that provided a higher incentive to ethanol produced from non- (continued...)

introduced but not adopted, including an amendment that would require only the midwestern states to participate.¹¹

(...continued)

com feedstock. "Senate Unable to Take Significant Step with Bill," *Platts Inside Energy*, June 9, 2003.

¹¹ S.Amdt. 844 (108th Congress); S.Amdt. 851 (108th Congress); S.Amdt. 853 (108th Congress).

APPENDIX I:
FERC Authority



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MEMORANDUM

To: Senate Energy and Natural Resources Committee
Attention: Tristan Abbey

From: Adam Vann, Legislative Attorney

Subject: Federal Energy Regulatory Commission (FERC) Jurisdiction over Electricity Transmission and Retail Sales in Alaska

You have asked us for an explanation as to why FERC does not regulate electricity transmission and wholesale sales in the State of Alaska. This memorandum explains that the Federal Power Act (FPA), the law from which FERC derives its jurisdiction over electricity transmission and wholesale sales, covers such transmission and sale only to the extent that it is “in interstate commerce,” and that transmission and sales in the State of Alaska have been deemed not to be in interstate commerce.

Part II of the FPA governs the regulation of electric utility companies engaged in interstate commerce, and is the source of FERC’s electricity jurisdiction.¹ Section 201(b)(1) provides that Part II applies “to the transmission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce, but ... shall not apply to any other sale of electric energy...”² This limitation on the reach of the FPA, and thus the federal role in regulation of the electric energy industry, is a product of the longstanding division of roles in the regulation of utilities between the federal and state governments, as well as the understanding of the reach of Congress pursuant to Article I Section 8 of the U.S. Constitution at the time of the enactment of the FPA.

The reach of the FPA, and thus of FERC, under Section 201(b)(1) extends beyond transmission of electric energy across state lines or wholesale sales of electric energy between parties in different states to include transactions where the facilities employed are “interconnected and capable of transmitting [electric] energy across the State boundary, even though the contracting parties and the electrical pathway between them are within one State.”³ However this jurisdiction does not extend to transmission and retail sales that take place entirely within a single state,

¹ Part II of the FPA initially assigned regulatory responsibility to the Federal Power Commission. In 1977, the Federal Power Commission was dissolved and its responsibilities were transferred to the Department of Energy (DOE) as well as the Federal Energy Regulatory Commission (FERC), an independent agency operating within DOE, pursuant to the Department of Energy Organization Act (P.L. 95-91). Title IV of that Act assigned administrative duties under Part II of the FPA to FERC.

² 16 U.S.C. §824(b)(1).

³ *Florida Power & Light Company*, 29 FERC ¶61,140 at 61,291-92 (1984).

using facilities that do not interconnect with those of another state. This situation is the case with Alaska and Hawaii. Because these states do not share a border with any other states, their electricity transmission facilities are not interconnected with those found in other states or capable of transmitting electric energy across state boundaries. As a result, FERC does not have jurisdiction over electricity transmission and retail sales in Alaska. FERC has confirmed this lack of jurisdiction.⁴

⁴ See Promoting Wholesale Competition Through Open-Access Non-Discriminatory Transmission Services by Public Utilities and Transmitting Utilities, Order No. 888, FERC Stats. & Regs. ¶31,036 at n 541 (1996) (“Section 201(b)(1) specifically exempts from Commission jurisdiction facilities used for transmission in intrastate commerce and transmission of electric energy consumed wholly by the transmitter. As a result, we have no jurisdiction over retail wheeling that occurs in Alaska, Hawaii and the Electric Reliability Council (ERCOT) portion of Texas since transactions in those areas are intrastate”).

What we have done in this white paper, and it is not very long so I would commend it to you all, but it details the various special exceptions that have been made for the State of Alaska, not because we are so special, other than the fact that we believe that we are pretty special, but we are special because of our resources. We have seen exceptions made over the years on LNG, on the renewable fuel standards, crude oil, FERC and then our signature achievement which is the Trans-Alaska pipeline.

So as I lay out more of these I will be sure to give you all a heads up. But as we think about the role that a state like Alaska can play or really any of our energy producing states, I think we recognize that there is a time that is required to put infrastructure in place to allow for exploration and production to move forward.

While some are panicked at the notion that we are sitting at low oil prices and have been for some period of time and are suggesting that we should not be looking to make longer-term investment, I am looking at it and taking the exact opposite view. I will be interested in hearing from our panelists this morning in terms of your thoughts and your comments in this vein.

With that, I am going to turn to Senator Heinrich, who is standing in this morning for the Ranking Member, Senator Cantwell.

Senator Heinrich, I appreciate your leadership on this panel at all times, but I also want to particularly thank you for your help with the Energy Policy Modernization Act and the Sportsmen's provisions that we were able to include in that. So thank you.

We look forward to your comments this morning.

STATEMENT OF HON. MARTIN HEINRICH, U.S. SENATOR FROM NEW MEXICO

Senator HEINRICH. Thank you, Madam Chairman.

I think it is a testament, a testimony, to your leadership and to Ranking Member Cantwell's leadership that this particular Committee has been so productive at a time where we will find that to be the exception rather than the rule around here.

I want to thank you for scheduling this hearing to examine challenges and opportunities for oil and gas developments in different price environments. Senator Cantwell was not able to attend and asked me to fill in for her, and I want to thank our witnesses for joining us today.

Energy markets have been changing pretty rapidly in the last couple of years, particularly in the oil and gas sector. At the end of 2015 there were several policy changes that affect energy markets including removing the restrictions on exports of crude oil. Just last week, obviously, we passed the Energy Policy and Modernization Act of 2016 on a big, bipartisan vote, 85 to 12.

It is the first broad, comprehensive bill that the Senate has passed since 2007 when my predecessor was on this Committee, Senator Bingaman.

It is important to understand that the recent developments in expectations for the market, such as oil and natural gas, as we consider any new policy changes. Earlier this year, in January and February, the global and domestic crude oil prices fell to \$26 a barrel, prices we have not seen in over a decade, and just last month

natural gas prices fell below \$1.60 per million BTUs. Those are prices we have not seen since the 1990s.

This current low price environment for oil and natural gas presents both challenges and opportunities, the topic of today's hearing. For oil and natural gas producers in New Mexico and elsewhere the low prices are reducing investments and causing significant job losses, even bankruptcies, for some companies.

The economies in the major producing parts of my state, San Juan County and the San Juan Basin, the Permian Basin in Southeast New Mexico, are struggling.

Though the recent growth in production is starting to slow, unfortunately, price volatility is not a new phenomenon. The long history of the oil and gas industry has been one of boom and bust cycles.

While oil and gas companies are looking for ways to cut costs in a current low price environment, we must remain vigilant about ensuring both safety and protecting our land and water.

For example, last week was the sixth anniversary of the BP Deepwater Horizon explosion and oil spill which was a human, economic and ecological disaster of epic proportions. Eleven members of the crew were killed in the explosion, and 17 others were injured. Oil spewed into the ocean unmitigated for nearly three months, a mile below the surface.

I remember having conversations with the Director of Sandia National Labs at that time who was one of the experts who was pulled in to help plug that well.

It is clear now that this disaster could have been avoided. Multiple blue ribbon panels all have concluded that the immediate cause of the Macondo blow out can be traced to a series of systematic failures in risk management and a broken safety culture.

The final version of the Offshore Drilling Safety regulations was published a couple of weeks ago. The final regulations tightened standards for blowout preventers and address the other primary causes of the Deepwater Horizon disaster, inadequate risk management and safety oversight, by codifying the advances made by industry experts and regulators over the last five years.

Today's low oil and natural gas prices also present an opportunity for consumers in the larger economy. Recent low oil and natural gas prices have provided real savings for consumers.

For example, AAA estimates that Americans saved more than \$115 billion on gasoline in 2015 compared to 2014, which was an average of more than \$550 per driver, real money.

In its monthly, short-term energy outlook, the U.S. Energy Information Administration predicts that this year's April to September driving season will feature the lowest gasoline prices in 12 years, averaging \$2.40 a gallon this summer, down from \$2.63 last summer.

EIA data on natural gas also paints a picture friendly to consumers. The agency forecasts low natural gas prices will push down average residential electricity prices this year for the first time since 2002; however, these fossil fuel commodities are still susceptible to price swings. Less than two years ago, oil prices were over \$100 a barrel and natural gas prices were spiking to levels

four times those today, but experts agree that we are in a new era of natural gas abundance and low prices.

Most experts also agree that oil prices will go up again. It is just a matter of when and how much. The low natural gas prices and increasing supplies of natural gas have helped with diversification of the electric power sector both here and abroad, but the same is not true related to low oil prices. Over 70 percent of the petroleum consumption in the U.S. is for the transportation sector, and 91 percent of the transportation sector is fueled by petroleum.

We need to embrace policies that encourage efficiency and diversification of the transportation sector so that it is not dependent on one volatily-priced commodity. These policies can provide additional savings for consumers. The CAFÉ standards put in place in 2007 are estimated to save consumers \$140 billion by 2030.

Once again, I want to thank the Chair for holding this hearing, and I am looking forward to the testimony of all of our witnesses.

The CHAIRMAN. Thank you, Senator Heinrich.

Before I introduce the witnesses and ask you to provide us with your statements, I will remind colleagues we have three votes set for 11 o'clock this morning. It is my intention to keep the Committee moving throughout those votes, so I would advise you to keep plugged into your electronic devices so you do not miss the vote. We will continue on, and we will just pass the gavel back and forth here.

To our witnesses, we apologize for bumping you last week and now we apologize for being jumping jacks here at the Committee, but this is the U.S. Senate and we are doing business. We have work to do today and certainly not the least of which is to hear your comments and your contributions.

We are joined this morning by Mr. Jason Bordoff, the Founding Director for the Center on Global Energy Policy, and Professor of Professional Practice in International and Public Affairs at Columbia University. Welcome.

Mr. Oren Cass is a Senior Fellow at the Manhattan Institute. We welcome you this morning.

Ms. Suzanne Minter is the Manager of Oil and Gas Consulting Services for Platts Analytics. Thank you.

Ms. Leslie Palti-Guzman, I hope I am pronouncing that right, is the Director of Global Gas for the Rapidan Group. Welcome.

Rounding out the panel we have Mr. Michael Ratner, who is a specialist in Energy Policy at the Congressional Research Service. So we welcome you all.

We ask that you try to keep your comments to five minutes. Your full statements will be included as part of the record. Once you have concluded, we will all begin our questions.

Thank you. Mr. Bordoff, would you please proceed?

STATEMENT OF JASON BORDOFF, FOUNDING DIRECTOR, CENTER ON GLOBAL ENERGY POLICY, AND PROFESSOR OF PROFESSIONAL PRACTICE IN INTERNATIONAL AND PUBLIC AFFAIRS, COLUMBIA UNIVERSITY SCHOOL OF INTERNATIONAL AND PUBLIC AFFAIRS

Mr. BORDOFF. Thank you, Chairman Murkowski. Thank you, Senator Heinrich, members of the Committee. Thanks for the invitation to be here today.

I will just briefly summarize the three points that I make and elaborate in my written testimony.

First, on the impacts of the oil price collapse. The oil price collapse has hurt workers, families, communities. U.S. oil production is now falling rapidly, although on net, lower prices are still a boost to the U.S. economy, albeit a smaller one than has been the case in the past.

In the face of the oil price collapse, U.S. oil production has been much more resilient than many people expected it to be. U.S. oil production peaked in April 2015, has since fallen and will continue to fall, certainly, over the next year. Oil and gas companies have slashed capital investment and jobs causing hardship for communities, especially in oil-producing states like Alaska and many others. At the same time, the U.S. oil sector has lowered costs, has improved technology and productivity and efficiency to cope with the pressure of the low oil price and in many ways will be in a stronger position to weather the next inevitable future downturn in oil prices.

On net the U.S. is still the world's largest consumer and a very large importer of oil. And so, a decline in the oil price offers a macro economic boost. But as I said, this positive impact is smaller than many had anticipated. And that's because consumers are spending less of the savings from lower fuel prices. The big employment gains from the shale boom are being thrown into reverse. And as a smaller importer, more of the consumer benefit of low prices is coming at the expense of domestic producer revenue.

My second point in the testimony is that while oil prices are low today it goes without saying that it's very far from clear that they will remain low and in fact, may be more volatile going forward. Currently the oil market is over-supplied, but low oil prices are starting to do what low oil prices do and take their toll on supply, not only in the U.S. but in other countries too, like China and Mexico and Colombia and others.

Roughly \$400 billion in global capital investment has been cut back, meaning less supply is coming online in the years to come. And low oil prices are stimulating more global oil demand including here in the U.S.

Iran is ramping up production after the lifting of sanctions, although running into some difficulty in doing that. OPEC may yet try to reinsert itself. We'll see. That doesn't seem all that likely right now, but it's certainly a possibility. And geopolitical risks abound in major oil producing states.

Recent supply disruptions and pipeline sabotage in Iraq and Nigeria, the looming economic and social collapse in Venezuela, the recent worker strike in Kuwait, the ongoing civil strife in Libya, all of these, I think, are reminders of the risk to supply from conflict,

from poor governance, from political dynamics, from economic turmoil. And moreover, with OPEC's spare capacity at historic lows any disruption that does occur to global oil supply can have an outsized impact in the market because there's little buffer in the event of a supply disruption.

U.S. shale is a short cycle source of supply. It can respond more quickly to changes in price, but that doesn't happen overnight the way spare capacity can be brought to the market in a matter of weeks. And it takes, certainly shorter than conventional oil, but still can take, we don't fully know for sure, we're kind of learning as we go with shale oil, but can take maybe up to a year to respond to changes in price. And the result of that without adequate inventories which we do have plump inventories now, may mean more price volatility looking forward.

My final point is that regardless of price, government must ensure oil and gas is produced safely and responsibly. It must correct market failures like pollution. It must assess risks and benefits in determining whether to allow drilling on Federal lands. It must consider permit applications for energy infrastructure to ensure environmental impacts are understood and that they're mitigated.

And those fundamental roles for government don't change in different oil price environments. In all cases government needs to design smart, cost effective, narrowly tailored regulations. But it would be short sighted to weaken, in my view, well designed, necessary regulations because of short term oil price fluctuations.

I think methane leakage is a good example of that where a lot of good work has shown that that can be reduced at fairly low cost in the market.

So in short, just to close, I think today's oil market is in the midst of profound transformation creating new challenges, opportunities for workers and communities for the oil industry, for climate policy and for the economy, overall. Predicting oil prices is fraught with pitfalls but whatever they are, government's regulatory responsibility that remains to protect air and water or other resources and do it as smart and cost effective a manner as possible.

Thank you for the opportunity to testify today.

[The prepared statement of Mr. Bordoff follows:]



April 26, 2016

Congressional Testimony of

Jason E. Bordoff

Founding Director, Center on Global Energy Policy, and Professor of Professional Practice in International and Public Affairs, Columbia University School of International and Public Affairs

Before the
Committee on Energy and Natural Resources
United States Senate
2nd Session, 114th Congress

Chairman Murkowski, Ranking Member Cantwell and Members of the Committee, thank you for inviting me here today to discuss challenges and opportunities for oil and gas development in different price environments.

In my testimony today, I would like to make three main points:

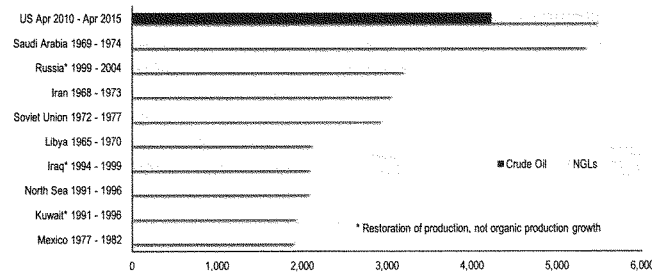
- First, the oil price collapse has hurt many workers, families and communities by causing job losses in oil-producing states, with U.S. oil production now falling sharply after a lag. While low oil prices, on net, are a boost to the U.S. economy, that benefit has been more muted than many expected based on past experiences.
- Second, while oil prices are low today, it is far from clear they will remain low. The oil industry has long known cycles of boom and bust, and there are many factors today that may combine to cause a price spike more quickly than anticipated. Moreover, oil prices moving forward may be more volatile than in the past.
- Third, as the committee knows, the federal government has a diverse set of responsibilities regarding energy production, including to protect air and water quality, regulate oil and gas production on public lands, correct market failures, and more. These roles are necessary, and government should design smart and cost-effective regulations regardless of oil prices, particularly as this commodity's future supply, demand, trade, and price trends are notoriously difficult to forecast.

Current Market Conditions and Economic Impacts

We are in the midst of one of the steepest oil price collapses in history. In June 2014, oil markets tipped into the current down cycle that has sent prices from over \$115 a barrel to lows in the \$20s in early 2016, before rebounding to their current level of around \$40-45 per barrel. Many factors contributed to this collapse, but perhaps the most significant was the unprecedented rise in U.S. oil production driven by the shale revolution. From 2010 to 2015, the U.S. experienced the largest five-year ramp-up in oil production of any country in history (Figure 1), rising to a peak of 9.7 million barrels per day (b/d) in April 2015. From 2005 to 2015, U.S. natural gas production increased more than 50 percent (Figure 2). Both of these production booms were made possible by technological advancements combining horizontal drilling and hydraulic fracturing that allowed oil and gas to be extracted economically from shale and other tight geologic formations.

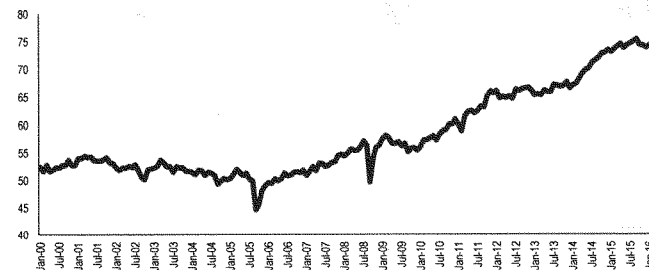


Figure 1: **Largest Build-Outs in Oil Production over a Five-Year Period**
(Thousands of barrels per day)



Source: BP Statistical Review of World Energy 2015, EIA

Figure 2: **US Dry Natural Gas Production**
(Billion cubic feet per day)



Source: EIA Short-Term Energy Outlook

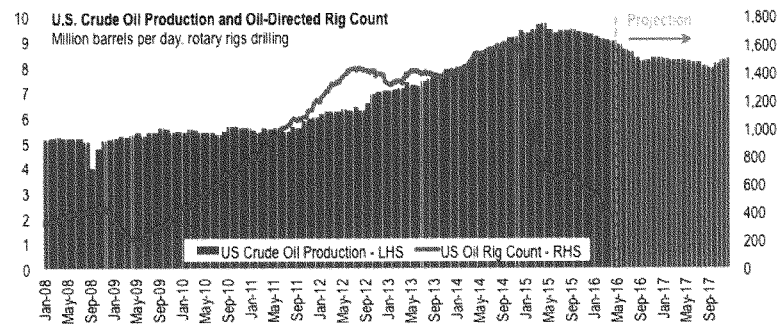
As prices started to slide in the summer of 2014, OPEC found itself confronted by surging high-cost supply, including from the U.S., and an inability to forge agreement among OPEC and certain non-OPEC countries to curb production, particularly with Iran's looming return to the oil market post-sanctions. Consequently, OPEC took no action at its November 2014 meeting, and oil prices fell off a cliff. Indeed, in 2015, OPEC countries sharply increased production, with Iraq and Saudi Arabia together rising 1.2 million b/d from 2014 to 2015.

Many expected that US production would fall sharply as a result, as U.S. shale oil output was perceived to be high-cost supply that was not economic at lower prices. Analysts believed that tight oil supply required an average break-even price of around \$60 to \$70 per barrel range to be



economically viable.¹ In reality, U.S. tight oil production proved far more resilient than many expected. There were many factors driving this: producers rapidly improved drilling efficiency and productivity; service costs declined; producers shifted their focus to the most productive shale plays (aka “high-grading”); many producers had their production hedged in 2015; and some producers were required to drill certain areas in order to keep their leases. As a result, even with the price collapse, U.S. production kept rising in the first half of 2015, and then declined only gradually—even as the total rig count collapsed 78 percent (Figure 3).

Figure 3: US Crude Oil Production and Oil-Directed Rig Count



Source: EIA; Baker Hughes

Eventually, the reality of tight oil supply caught up with the collapse in the rig count. Tight oil production has much steeper decline rates than conventional oil wells. Output from a tight oil well can fall as much as 70 percent in the first year.² That means that in order to keep growing production, firms need to keep drilling more and more wells. But that is no longer happening. As a result, U.S. oil production fell from 9.7 million b/d in April 2015 to 9 million b/d in March 2016, and is projected by EIA to fall a further 1 million b/d by the middle of next year, before beginning to rebound.³

In one way, the oil price collapse may come to be seen in retrospect as an opportunity for the U.S. oil sector to make itself stronger and more resilient. Eventually, prices will recover, and U.S. output will start to rise again. And this will likely happen at lower prices than many previously believed because the intense economic pressure of this current downturn has forced oil companies to find new and innovative ways to improve their efficiency, productivity, and cost-effectiveness. The U.S.

¹ See, e.g., “Global liquids cost curve: shale is pushing out oil sands and Arctic, offshore is still in the race,” Rystad Energy, June 12, 2014, <http://www.rystadenergy.com/NewsEvents/PressReleases/global-liquids-cost-curve>.

² RBN Energy, “The Good, the Bad, and the Ugly: The Dynamics of U.S. Production Declines and Eventual Rebound,” 28 March 2016, p.6, https://rbenenergy.com/system/files/subscriber/rbn_good_bad_ugly_shale_decline_03282016.pdf.

³ EIA Short Term Energy Outlook database.



may be a short-cycle supplier, but it is most certainly not the high cost supplier (as some previously described it), and that may allow it to better weather future downturns.

The oil patch has been hit hard by the price collapse. The U.S. oil and gas sector has lost nearly 100,000 jobs since January 2015.⁴ Total employment impacts are larger than that because employees who lose their jobs in the oil and gas sector may reduce spending on other goods and services, such as restaurants, which can lead to reductions in local service sector employment. Economists at the Federal Reserve Bank of Dallas, for example, estimate that a 50 percent sustained drop in oil prices would reduce Texas employment by 1.2 percent, or 140,000 jobs.⁵ The economic impact would be even more severe in percentage terms in states in which oil and gas is a larger share of the economy, like Wyoming, Oklahoma, North Dakota, Alaska.⁶ U.S. oil companies are planning to cut back investments by 50 percent on average this year following a 40 percent average cut in capital expenditures last year, and nearly 60 American oil and gas companies filed for bankruptcy between January 2015 and April 2016.⁷

On net, however, the U.S. is still the world's largest oil consumer and a very large oil importer (even with the recent decline in imports), and thus a fall in oil prices offers a macroeconomic boost by reducing consumer spending on fuel. Americans today are spending \$180 billion less each year on energy goods and services than we were in July of 2014, which corresponds to about 1 percent of GDP.⁸ A year and a half ago, energy expenses constituted 5.4 percent of total consumer spending. Today that share is down to 3.7 percent.⁹

Yet the oil price fall is providing less of a macroeconomic boost than many had anticipated. The reason requires further study, but there appear to be several potential factors at work. First, while there was some boost to consumer spending from the lower gasoline price, it was much lower than would have been expected based on the historical relation between spending and energy prices.¹⁰ Second, the net benefit to the U.S. is smaller because the U.S. is such a larger producer, and the big employment gains from the shale boom are now being thrown into reverse.¹¹ Third, as the White House Council of Economic Advisers recently explained, because the U.S. is a much smaller net oil

⁴ Devashree Saha and Mark Muro, "Rigged: Declining U.S. oil and gas rigs forecast job pain," Brookings Institution, 16 March 2016, <http://www.brookings.edu/blogs/the-avenue/posts/2016/03/16-declining-us-oil-gas-rigs-saha-muro>.

⁵ Mine Yucel, "Plunging Crude Prices: Impact on U.S. and State Economies," August 7, 2015, https://www.dallasfed.org/assets/documents/research/events/2015/15vistas_yucel.pdf.

⁶ Stephen P.A. Brown and Mine K. Yucel, "The Shale Gas and Tight Oil Boom: U.S. States' Economic Gains and Vulnerabilities," Council on Foreign Relations, October 2013, <http://www.cfr.org/united-states/shale-gas-tight-oil-boom-us-states-economic-gains-vulnerabilities/p31568>.

⁷ Haynes and Boone, LLP Oil Patch Bankruptcy Monitor, 4 April 2016, http://www.haynesboone.com/~media/files/attorney%20publications/2016/energy_bankruptcy_monitor/oil_patch_bankruptcy_20160106.ashx.

⁸ James Hamilton, "Why no economic boost from lower oil prices?," Econbrowser Blog, April 10, 2016, <http://econbrowser.com/archives/2016/04/why-no-economic-boost-from-lower-oil-prices>.

⁹ Ibid.

¹⁰ Ibid.

¹¹ See, e.g., James Feyrer, Erin T. Mansur, Bruce Sacerdote, "Geographic Dispersion of Economic Shocks: Evidence from the Fracking Revolution," NBER Working Paper No. 21624, October 2015, <http://www.nber.org/papers/w21624> (finding that the shale boom caused the number of Americans working to be 750,000 higher and the unemployment rate to be 0.5 percent lower during the Great Recession than it otherwise would have been).



importer than it was before, when the price falls, more of the consumer benefit comes at the expense of domestic producer revenue, thus providing less of a macroeconomic boost.¹²

So far, I have discussed the supply impacts of the oil price collapse, but the demand impacts also represent a challenge. Consumers have responded to the lower prices. In the U.S., SUV sales were up 16 percent¹³ and plug-in electric vehicle sales were down by 17 percent in 2015.¹⁴ U.S. gasoline demand, which many thought had peaked in 2007, has been rising and is projected by EIA to equal 2007 levels again in 2016 and 2017. Overall, U.S. oil demand increased 1.5 percent in 2015 and is projected to increase further by 0.6 percent and 1.0 percent in 2016 and 2017, respectively. With falling domestic production and rising demand, U.S. net oil imports in January 2016 were up 650,000 barrels per day from a year earlier.

Increased petroleum dependence reduces our energy security. Despite today's low price, as I noted, the U.S. is still a significant consumer and importer of oil. Thus we increase our energy security if we reduce oil consumption and concomitantly the exposure of the U.S. economy to inevitable oil price fluctuations in the future—not to mention the climate and environmental imperative to reduce oil consumption. Policies to reduce oil demand and investments in alternative transportation fuel R&D not only increase our energy security, but also reduce greenhouse gas emissions that lead to potentially severe climate change impacts.

While I have focused on oil supply and demand, let me briefly say a word about natural gas. Domestic natural gas producers have also been impacted by the oil price drop. Natural gas prices in the U.S. have been very low for some time. Available evidence suggests that the U.S. has a large supply of inexpensive natural gas. Despite the loss of so-called “associated gas” production—gas produced as a byproduct of producing oil—even as oil output falls, U.S. gas output has continued to rise, and the EIA expects continuing increase in 2016-2017. U.S. marketed natural gas production reached a record high level of 79 billion cubic feet per day (Bcf/d) in 2015, an increase of 5% from the previous year, even as natural gas prices remained relatively low (Figure 4). U.S. natural gas consumption was weak as a result of the warm winter, but still rose 2.1 Bcf/d to 75.3 Bcf/d in 2015. Perhaps the primary implication of the fall in oil prices has been the sharp drop in natural gas prices elsewhere in the world, especially Asia, where gas prices are often linked to the price of oil. This changed market outlook has raised questions about the global market for liquefied natural gas (LNG) exports, including from the U.S. In late February, a historic milestone was reached when the first ever large-scale shipment of LNG from the lower 48 states set sail for export, a development that I believe may have significant geopolitical implications.¹⁵

¹² Council of Economic Advisers, “The All-Of-The-Above Energy Strategy as a Path to Sustainable Economic Growth,” 2014, p.3,
https://www.whitehouse.gov/sites/default/files/docs/aota_report_updated_july_2014.pdf.

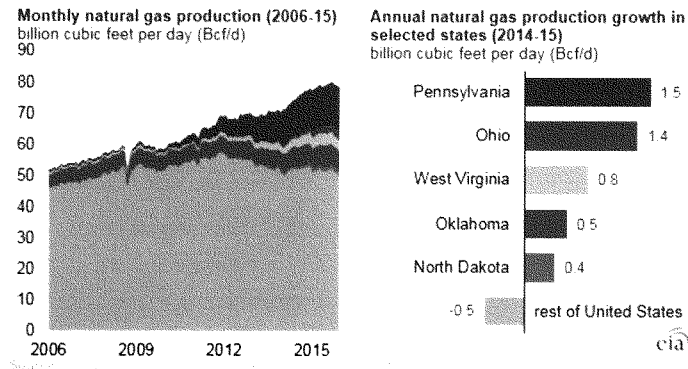
¹³ James B. Stewart, “The SUV Arms Race Goes Upscale,” *New York Times*, April 14, 2016,
<http://www.nytimes.com/2016/04/15/business/the-suv-arms-race-goes-upscale.html>.

¹⁴ Dana Hull, “Plug-In Electric Autos Left Behind in Record U.S. Year,” *Bloomberg*, January 6, 2016,
<http://www.bloomberg.com/news/articles/2016-01-06/plug-in-electric-vehicles-left-behind-in-u-s-autos-record-year>.

¹⁵ Jason Bordoff and Akos Losz, “The United States Turns On the Gas: The Benign Energy Superpower?,” *Foreign Affairs*, 4 March 2016, <https://www.foreignaffairs.com/articles/2016-03-04/united-states-turns-gas>.



Figure 4: U.S. Natural Gas Production Growth



Source: Energy Information Administration

Lower for Longer?

With the sustained drop in oil prices, “lower for longer” is the new mantra. The futures market, admittedly a poor predictor of future prices, is pricing oil below \$50 per barrel through 2019. That may prove to be true, but we should remember that the oil industry historically has been marked by boom and bust,¹⁶ starting with the discovery of oil in Pennsylvania in 1859, which helped crash the price of oil from \$16 per barrel in 1859 to 50 cents in 1861, before the onset of the Civil War brought a surge back to \$8 per barrel by 1864.¹⁷

Currently the global market is oversupplied and inventories are at a very high level, which will weigh on prices for some time to come. At the same time, the best cure for low prices, the saying goes, is low prices. U.S. production is falling sharply now. Further production declines are expected this year from China, Mexico, and Colombia. And roughly \$400 billion in global capital investment cuts means that less supply will be available in the years to come.¹⁸ Meanwhile, consumers are responding

¹⁶ Robert McNally, “Welcome Back to Boom-Bust Oil Prices,” *Center on Global Energy Policy Commentary Series*, 17 December 2015, <http://energypolicy.columbia.edu/sites/default/files/energy/Commentary-%20Welcome%20Back%20to%20Boom-Bust%20Oil%20Prices.pdf>.

¹⁷ James D. Hamilton, “Historical Oil Shocks,” University of California, San Diego, 1 February 2011, p. 2-3, http://econweb.ucsd.edu/~jhamilton/oil_history.pdf; U.S. Energy Information Administration, Domestic Crude Oil First Purchase Prices by Area, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=F000000__3&f=A.

¹⁸ “Deferred Upstream Projects Tally Reaches 68,” Wood Mackenzie, January 14, 2016, <http://www.woodmac.com/media-centre/12530462>.



to low prices: global oil demand, which grew only 0.9 million b/d in 2014, grew 1.8 million b/d last year, and is projected to rise another 1.2 million b/d this year.

Beyond market fundamentals, there are other factors that may cause prices to swing back up. Iran is ramping up production after the lifting of sanctions, but recent indicators suggest this will be neither as easy nor as quick as Tehran's lofty claims would suggest. Despite OPEC's failed effort to freeze production in Doha, it may yet try to reassert itself by curtailing output.

And geopolitical and economic risk to oil supply abounds. The conflicts that erupted in the aftermath of the Arab Spring across the oil-rich Middle East and North Africa region show little sign of abating. Libya remains mired in a protracted civil war. Recent supply disruptions and pipeline sabotage in Iraq and Nigeria remind of the supply risks from conflict, political dynamics and poor governance. Nigeria has seen rising militancy in the Niger Delta and growing risks highlighted by President Buhari's decision to redeploy troops from the North to the oil-rich South. Ongoing tensions and disagreements between Turkey, the Kurdistan Regional Government, and Iraq remain a continued threat to oil supply in Northern Iraq. Venezuela—the largest oil producer in Latin America and sixth largest within OPEC—is close to economic and social collapse. The country enters the third straight year of deep recession, the inflation rate is projected to exceed 200 percent in 2016, and the risk of sovereign default remains very high. A worker strike in Kuwait that slashed oil output by more than half last week was short-lived, but reminds of the potential for new and unexpected supply risks. In short, there are no lack of global problems that could impact supply and prices in the oil market.

If a significant supply disruption were to occur, there is also less of a cushion in the global oil market to handle it, with OPEC spare capacity—oil that can be quickly brought onto the market to compensate for production losses elsewhere—at historic lows. OPEC's effective spare capacity, most of which is held by Saudi Arabia, is currently estimated by the IEA to be 2.7 million b/d,¹⁹ although many believe it is actually much lower. Even the higher number represents less than three percent of global demand. By contrast, for most of the 1990s, OPEC spare capacity averaged closer to five percent of global demand.

In a world with very narrow spare capacity, any disruption to global supply can have an outsized impact on price because there is little buffer in the event of supply disruptions.

Once the market comes back into balance, likely later this year or next, and inventories begin to draw down, prices could rise more quickly than expected given all these factors. A key question then is whether the U.S. can act as a new sort of "swing supplier" to quickly ramp up production and stem the price rise. Because the decline rates are steep and upfront costs low, shale oil production, in theory, can rise quickly once companies start drilling again. In truth, we do not know how quickly U.S. production can start rising again or at what oil price that happens. Shale oil is a new phenomenon. Yet we know it will not happen overnight. It takes time for capital markets to open up, for companies to get the rigs and equipment, and for laid-off workers to return. Even if prices rise back to \$55 or \$60 per barrel, around the level at which many expect U.S. supply could begin rising again, it may take 9 to 12 months for domestic production to follow that market signal.

¹⁹ International Energy Agency, Oil Market Report, April 14, 2016, p. 17.



Historically, dominant producers have tried, with varying degrees of success, to curb boom and bust cycles by managing supply—from John Rockefeller and Standard Oil to the Texas Railroad Commission to OPEC. Today, the oil market is functioning more like a free market, as OPEC's hold is loosened and it is letting low prices bring the market back into balance. If OPEC, particularly Saudi Arabia, continues to abstain from any effort to manage the market by hiking or cutting supply, and the U.S. has a notable lag in its ability to respond, the impact may be more price volatility ahead.

Policy Implications of a Low-Price Environment

The low oil price may have certain near-term implications for energy policy. For example, a lack of public concern with current low gasoline prices may have made it easier for Congress to repeal the ban on U.S. crude oil exports. Higher projected gasoline use creates a bit more headroom for biofuels to enter the fuel system before the so-called “blend wall” is reached. Reduced sales of fuel efficient cars will increase pressure by some to curtail fuel economy standards in the 2018 midterm review, even as it causes others to argue the standards should be ratcheted up to offset increased consumer preference for less fuel efficient cars. And potential geopolitical instability in key oil producing regions is a national security concern to which policymakers should be carefully attuned.

As a general matter, however, energy and environment policy should be formulated without excess consideration given to short-term fluctuations in oil prices. As noted above, prices will go up and down, often rapidly. Regardless of the price, government has a responsibility to ensure oil and gas production is done in a safe and responsible manner that protects precious air and water resources. Government has a role to correct market failures, like policies to reduce carbon emissions that contribute to climate change, a social cost that is not internalized in the price we pay for energy. Government has a role to determine which federal lands to open to energy exportation, based on a careful assessment of potential environmental risks and impacts, as well as the potential benefits that come from increased domestic energy supply and reduced import dependence. Government has a role to play in evaluating permit applications for new energy infrastructure projects, from pipelines to transmission lines and more, to ensure potential environmental impacts are understood and mitigated.

These fundamental roles for government do not change in different oil price environments. When oil prices are low, and industry is under acute economic pressure, there can be pressure to weaken environmental regulations, yet that would be short-sighted. Whether prices are high or low, government regulators must protect our air and water, and should do so with carefully crafted, smart regulations that achieve their environmental goals at the lowest cost to companies and consumers.

Consider the case of methane emissions from oil and gas production. Methane is a potent greenhouse gas. Yet excellent work from the Environmental Defense Fund and others has shown that methane leaks can be greatly reduced at very low cost. As a result, well-designed methane regulations are a cost-effective way to reduce greenhouse gas emissions when compared to the social cost of such emissions, and thus should be pursued even when oil prices are low and the industry is hurting.



Similarly, low gasoline prices have reduced demand for fuel-efficient vehicles, leading to arguments that the Obama Administration's ambitious fuel economy standards should be weakened when they come up for a midterm review in 2018. Yet the entire point of a government regulation to increase fuel efficiency—thus reducing oil imports and pollution—is to push the automotive market to achieve a level of fuel efficiency that it would not on its own. A policy that induces car makers to produce and price vehicles differently to alter the mix of the fleet is more, not less, important when prices fall, precisely because the market would not achieve this result on its own. Even at today's lower oil prices, increasing fuel economy standards still delivers net benefits to society and helps to protect consumers against future oil price volatility.²⁰

Nor should decisions about whether to open or not open particular areas to exploration, or approve certain pieces of infrastructure, be determined based on today's outlook for production, demand, trade, and prices. As discussed above, today's market conditions can and will change—it is only a question of when—and often those changes occur far more rapidly than many expect. Moreover, our ability to anticipate those changes is limited. Consider that a decade ago, in 2005, the EIA projected that the U.S. in 2015 would be a net importer of 19 billion cubic feet per day of natural gas. Instead, we just exported the first-ever large-scale LNG cargo from the lower-48 and will soon be a net exporter.

CONCLUSION

Today's oil market is in the midst of a profound transformation, driven by new technologies, global efforts to transition to cleaner energy sources, a shale revolution in the U.S., a historic shift in OPEC's market role, changing geopolitical and trade relationships, and many other factors. Predicting what the oil market, and certainly oil prices, will look like over the next several years is fraught with pitfalls. The oil price collapse of the last 18 months has brought hardship to companies, workers and communities in many oil-producing states, and is starting to cause U.S. oil production to decline. It has also brought many geopolitical and economic challenges to oil-producing countries globally, and undermined the push for alternative transportation fuels. At the same time, it has brought opportunities—providing a boost to U.S. consumers and GDP, making the U.S. oil industry far more efficient and lowering its costs, and enabling countries to remove economically and environmentally wasteful fuel subsidies.

Despite these near-term challenges and opportunities, the basic responsibility of the federal government to protect air and water quality, regulate oil and gas production on public lands, evaluate permit applications for energy infrastructure, correct market failures, and more, do not fundamentally change with oil prices. Whether oil prices are high or low, government should take care to design smart regulations as cost effectively as possible, and not let short-term fluctuations in oil prices unduly influence the formulation of energy and environment policy.

²⁰ Varun Sivaram and Michael Levi, "Automobile Fuel Economy Standards in a Lower-Oil-Price World," Council on Foreign Relations Discussion Paper, November 2015, http://www.cfr.org/energy-policy/automobile-fuel-economy-standards-lower-oil-price-world/p37190?cid=otr-marketing_use-cafe-standards.

The CHAIRMAN. Thank you, Mr. Bordoff.
Mr. Cass.

**STATEMENT OF OREN CASS, SENIOR FELLOW, MANHATTAN
INSTITUTE FOR POLICY RESEARCH**

Mr. CASS. Thank you for inviting me to participate in today's hearing.

In my view, natural resource policy should disregard the energy price environment for three reasons. First, because policy decisions take decades to play out. Second, because market prices and predictions say little about what future prices will actually be. And third, because innovation and exploration change the scale and economics of resources constantly. Therefore, the appropriate Federal role is to establish a clear, stable framework within which the private sector can make long-term investments. This approach is likely to maximize output and minimize the cost of that output.

Of course, those who oppose development of American energy will therefore oppose it across price environments, and they do. But when energy prices are high, they argue the timelines are too long to justify investment. And when prices are low, they ask what's the rush? This is disingenuous. The debate over domestic production should proceed on the merits not with reference to yesterday's closing price.

And if anyone ever doubted the true value of American energy, the boom of the past ten years should have settled it. The benefits are broad and large, including reduced energy costs, increased employment, reduced dependence on imports and increased geostrategic power for the United States.

I'd like to offer a few examples that underscore the inappropriateness of reacting to the price environment and then turn to policy reforms.

First, it took Gulf of Mexico production 50 years to mature. Production began in the 1940's but it was not until the 1990's that advancements drove production costs down by 60 percent in a single decade and output first exceeded a million barrels per day.

The shale revolution was entirely unexpected, even after decades of research and experimentation. As recently as 2003 the USGS downgraded the estimate for our discovered, technically recoverable resources in the Eagle Ford Basin in Texas from 270 million barrels to 33 million barrels, total. In 2015 alone, the formation produced more than 500 million barrels.

And as recently as 2010 the EIA forecasted no foreseeable rise in U.S. oil production. Five years later it was reporting a 66 percent increase. Today some analysts believe the shale boom is over. Others say it is just beginning.

So with no credible forecast of how energy markets will evolve, but with the opportunity for enormous production under our feet, the best course for the nation is to let markets work. Private industry is best positioned and incentivized to put its own capital behind its own judgments about when and where to invest. It will place bets efficiently as long as it can trust the regulatory environment in which it must act.

And government must, in turn, make clear that it is open for business, that it supports efforts to expand production and that it

is committed to not whiplashing policy back and forth on the basis of the price environment.

Here are five examples of those types of policy reforms: First, clear legislatively binding road maps should dictate the opening of new areas both offshore and onshore; second, states should hold permitting authority over Federal lands within their borders; third, irresponsible calls to limit or ban fracking should be actively refuted with unambiguous legislation; fourth, looking downstream pipelines and export terminals for both oil and natural gas should be deemed in the national interest, and energy products should be placed on the same legal footing as other commodities for export; and fifth, new and expanded drilling sites, power plants, refineries and manufacturing facilities should face no heightened new source requirements.

I agree with Mr. Bordoff that environmental protection remains important regardless of the price environment, but that doesn't mean that it needs to stand in the way of production.

In closing, I would urge you not to underestimate the long-term potential of resources under Federal control. In fact, they hold the opportunity to repeat or even exceed the shale boom underway.

ANWR alone is estimated to have greater reserves than the entire Bakken formation in North Dakota and Montana. Estimates for other off limits areas offshore are expected to be four times larger still, and those estimates are often decades old and made without benefits of exploration and development. Actual production in the Gulf of Mexico led to a fivefold increase in the estimates of resources there.

If the question is what resources will America and the world need in future decades, the answer is that no one knows. But if the question is what course to pursue, we do know. Innovation and exploration have always benefited us and in hindsight, we are always glad they occurred.

The moment when new supply seems less critical is no less a moment when future investment should be encouraged.

Thank you again for the opportunity, and I look forward to answering your questions.

[The prepared statement of Mr. Cass follows:]

**Testimony of Oren M. Cass
before the Senate Committee
on Energy and Natural Resources
April 19, 2016**

Good morning Chairman Murkowski, Ranking Member Cantwell, and Members of the Committee. Thank you for inviting me to participate in today's hearing.

My name is Oren Cass. I am a senior fellow at the Manhattan Institute for Policy Research where my work addresses both energy and environmental policy.¹

My testimony today focuses on the implications of the energy price environment for federal energy policy, and my primary message to the committee is this: Congress should design energy development policy independent of prevailing market prices, for three reasons:

- First, the primary impact of policy decisions will not be felt for years or even decades;
- Second, market prices and predictions say little about what future prices will actually be; and
- Third, innovation and exploration will dramatically and unpredictably change both the scale and economics of various resource bases.

Therefore, the appropriate federal role is to establish a clear, stable framework within which the private sector can make long-term investments wherever it chooses. The same policies that make sense in a low-price environment make sense in a high-price environment.

This approach is most likely to produce the most efficient allocation of resources and maximize domestic production of energy while minimizing its cost. As the boom of the past ten years illustrates, the resulting benefits are broad: reduced energy costs for households and businesses, increased employment, reduced dependence on imports and exposure to price volatility, and increased geostrategic power for the United States at the direct expense of many of the worst actors on the global stage.

¹ For additional detail and analysis on many of the points contained in this testimony, see Oren Cass, "Step on the Gas: How to Extend America's Energy Advantage," Manhattan Institute for Policy Research, July 2015, http://www.manhattan-institute.org/pdf/ib_35.pdf.

Energy Policy Time Horizons

The exploration and extraction of natural resources occurs on decades-long timelines. Out-of-sight-of-land wells were first drilled in the Gulf of Mexico in the 1940s, but it was in the 1990s that technological advancements drove production costs down by 60 percent in a single decade² and output first exceeded 1 million barrels per day (bbl/d).³ Even in the current price environment, the U.S. Energy Information Administration (EIA) forecasts a 10 percent increase next year, to more than 1.8 million bbl/d.⁴

Similarly, the revolution in shale production that has upended global markets over the past eight years began with research in the 1970s and required decades of small-scale advancements.⁵ As recently as 2003, the U.S. Geological Survey (USGS) downgraded its estimate of undiscovered, technically recoverable resources (UTRR) in Texas's Eagle Ford shale formation from 270 million bbl to 33 million bbl.⁶ In 2015 alone, the formation produced more than 500 million bbl.⁷

Even well-understood and easily accessible resources take years to come online. As then-Senator Obama observed in a 2008 campaign speech, "George Bush's own Energy Department has said that if we opened up new areas to drilling today, we wouldn't see a single drop of oil for seven years. Seven years. And Senator McCain knows that, which is why he admitted that his plan would only provide 'psychological' relief to consumers."⁸ The seven years were up last year, in the midst of an oil glut.

When energy prices are high, opponents of expanding domestic production argue the timelines are too long to justify the approach. When energy prices are low, they ask "what's the rush?"⁹ But when anticipating resources that might come online a decade or more hence, the market price today is simply not relevant.

² "The Offshore Petroleum Industry in the Gulf of Mexico: A Continuum of Activities," Bureau of Ocean Energy Management, 2008, <http://www.boem.gov/Offshore-Petroleum-Industry-Organizational-Scheme/>.

³ "Federal Offshore—Gulf of Mexico Field Production of Crude Oil," EIA, <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pct&s=mcrrfp3fm2&f=a> (accessed April 15, 2016).

⁴ Matt Egan, "U.S. Gulf of Mexico Pumping Oil Like Never Before," CNN Money, March 11, 2016, <http://money.cnn.com/2016/03/11/investing/gulf-of-mexico-record-oil-production/>.

⁵ Loren King et al., "Lessons from the Shale Revolution," Breakthrough Institute, April 2015, http://thebreakthrough.org/images/pdfs/Lessons_from_the_Shale_Revolution.pdf.

⁶ S. M. Condon and T. S. Dyman, "2003 Geologic Assessment of Undiscovered Conventional Oil and Gas Resources in the Upper Cretaceous Navarro and Taylor Groups, Western Gulf Province, Texas," USGS, 2006, http://pubs.usgs.gov/dds/dds-069/dds-069-h/REPORTS/69_H_CH_2.pdf.

⁷ "Drilling Productivity Report," EIA, <http://www.eia.gov/petroleum/drilling> (accessed April 15, 2016).

⁸ Remarks by Senator Barack Obama (Lansing, MI), August 4, 2008, <http://www.nytimes.com/2008/08/04/us/politics/04text-obama.html>.

⁹ See, e.g., Carol Browner and Michael Conathan, "What the BP Oil Disaster Tells Us About Arctic Drilling: Keep Out!," *Newsweek*, April 20, 2015, <http://www.newsweek.com/what-bp-oil-disaster-tells-us-about-arctic-drilling->

Long-Term Price Forecasts

If policymakers had any capacity to accurately predict long-term energy price trends, they might use those forecasts to craft today's energy policy in anticipation of future price levels. They have no such ability. Indeed, policymakers of the early 2000s had no conception that oil prices might rise more than five-fold that decade, just as policymakers of the early 2010s had no conception prices might plunge back down.

To quote a recent paper in the *Journal of Economic Perspectives* by Christiane Baumeister and Lutz Kilian, "oil prices keep surprising economists, policymakers, consumers and financial market participants."¹⁰ Even financial market futures, they find, offer no meaningful guidance.

This should not be surprising. The determinants of long-term demand include not just economic growth and thus total energy demand, but also the evolution of energy consumption technologies that might change efficiency levels or the relative attractiveness of various forms of energy. Even if one could presume some reasonable level of global economic growth and energy efficiency improvement in the coming years, what share of new cars on the road will consume gasoline at all?

Supply projections are even less reliable. The scale and location of recoverable resources changes constantly, as does the cost of lifting those resources. As recently as 2010, the EIA forecast no upward trajectory in domestic oil production for the next five years. By 2015, its estimate for the year had increased 66 percent over its 2010 forecast.¹¹

The picture looking forward is no clearer. Some analysts believe the U.S. shale boom is over. My Manhattan Institute colleague, Mark Mills, believes it is only just beginning and estimates that production costs will continue to decline until on par with those of Saudi Arabia.¹² None of which even considers the possibility that other countries with shale reserves — China chief among them — might succeed in development of their

[keep-out-323475](#) ("But for the American people who, after all, own any oil that might be locked beneath the Arctic seabed, there's no rush. Domestic oil and gas production is already at record levels, and according to even oil and gas industry projections, continued technological innovation means that economic growth no longer requires an equivalent growth in fossil fuel consumption.").

¹⁰ Christiane Baumeister and Lutz Kilian, "Forty Years of Oil Price Fluctuations: Why the Price of Oil May Still Surprise Us," *Journal of Economic Perspectives*, Winter 2016, http://www-personal.umich.edu/~lkilian/bk8_110215r1.pdf; see also Brad Plumer, "Why Crude Oil Prices Keep Taking Us By Surprise," *Vox*, April 14, 2016, <http://www.vox.com/2016/4/13/11401564/crude-oil-prices-predictions>.

¹¹ "Annual Energy Outlook 2010," EIA, April 2010, [http://www.eia.gov/forecasts/archive/aeo10/pdf/0383\(2010\).pdf](http://www.eia.gov/forecasts/archive/aeo10/pdf/0383(2010).pdf) (table A11); "Annual Energy Outlook 2015," EIA, April 2015, http://www.eia.gov/forecasts/aeo/tables_ref.cfm (table A11).

¹² Mark P. Mills, "Shale 2.0: Technology and the Coming Big-Data Revolution in America's Shale Fields," Manhattan Institute for Policy Research, May 2015, http://www.manhattan-institute.org/pdf/eper_16.pdf.

own,¹³ or that the next “revolution” in oil sands or oil shale could be just around the corner. Finally, geopolitical events could at any moment cause substantial shocks in both short- and longer-term supplies.

If we do not know what will happen, we must plan accordingly.

The Federal Opportunity

While domestic oil and gas production outside of federal control exploded from 2010–2013, increasing respectively by 52 percent and 29 percent, it *fell* during the same period on federal lands and waters, decreasing respectively by 16 and 24 percent.¹⁴ One reason for this discrepancy is the disproportionate concentration of shale resources outside of federal control. But had those resources been under federal control and subject to the associated regulatory restrictions, permitting requirements, and political in-fighting, the development may never have happened at all. Looking beyond the shale boom and excluding North Dakota entirely, those states where the federal government controls less than 10 percent of land saw proved reserves increase 104 percent from 2008–2013, while those states where the federal government controls more than 50 percent of land saw reserves *decline* by 7 percent.¹⁵

Yet, the off-limits federal resources may be far richer than those driving the shale boom. Off-limits areas of the Outer Continental Shelf (OCS) are estimated to contain more than 40 billion bbl of technically recoverable resources. The Arctic National Wildlife Refuge (ANWR) contains another 10 billion. By contrast, the entire Bakken Formation in North Dakota is estimated to contain less than 10 billion bbl and that estimate was less than 1 billion bbl until the formation was well into development (*see figure*).¹⁶

Further exploration could reveal some of these federal resources to be smaller in scale than the preliminary estimates indicate, however the more common experience has been for exploration and development to beget ever-larger discoveries over time. For instance, from 1996–2011, the U.S. government’s resource estimate for off-limits areas of the OCS changed little. But the Gulf of Mexico, under active development, saw its

¹³ “Argentina and China Lead Shale Development Outside North America In First-Half 2015,” EIA, June 26, 2015, <https://www.eia.gov/todayinenergy/detail.cfm?id=21832>.

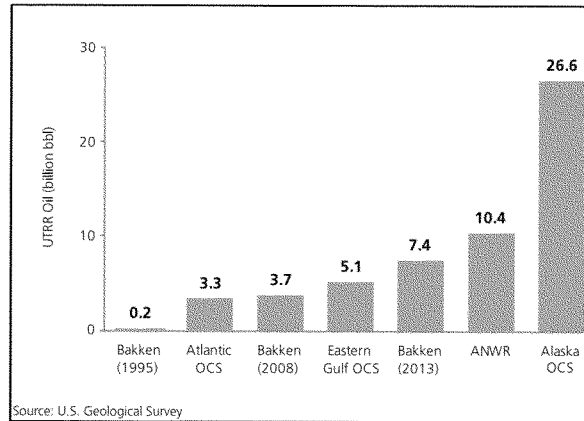
¹⁴ “Sales of Fossil Fuels Produced from Federal and Indian Lands, FY 2003 through FY 2013,” EIA, June 19, 2014, <http://www.eia.gov/analysis/requests/federallands> (table 1.g).

¹⁵ Ross W. Gorte et al., “Federal Land Ownership: Overview and Data,” CRS, February 8, 2012, <https://fas.org/sgp/crs/misc/R42346.pdf> (table 1, federal ownership of state land); “Crude Oil Proved Reserves, Reserves Changes, and Production,” EIA, December 4, 2014, http://www.eia.gov/dnav/pet/pet_crd_pres_a_epco_r01_nmmbbl_a.htm (reserves growth by state).

¹⁶ *Supra* note 1 (figure 7).

estimate increase five-fold — from a less-than-5 percent chance of finding 10 billion bbl to a best guess of nearly 50 billion bbl.¹⁷

Access to well-understood federal areas in the OCS and ANWR, as well as an opportunity to explore and invest in other onshore areas, has the potential for similar upside.



Stable, Pro-Production Policy

With no credible forecast of how energy markets will evolve, but with the opportunity for enormous production under its feet, the best course for the nation is to let markets work. Private industry is best positioned and incentivized to put its own capital behind its own judgments about what investments at what scale make sense where. It will place bets efficiently as long as it can trust the regulatory environment in which it must act. Government must make clear that it is “open for business,” supportive of efforts to expand production, and committed to *not* whiplashing policy back and forth in response to changing market conditions.

The objective should not be simply to open as much land as quickly as possible. Industry lacks capacity to invest everywhere at once and government lacks capacity to provide the requisite oversight. Rather, reforms should focus on the establishment of a clear and legally-binding (i.e., legislated) roadmap for the opening of new on- and

¹⁷ “Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation’s Outer Continental Shelf, 2011,” Bureau of Ocean Energy Management (BOEM), November 2011, http://www.boem.gov/uploadedfiles/2011_national_assessment_factsheet.pdf.

offshore areas over the coming five- and ten-year periods, including ANWR and off-limits OCS areas. USGS should regularly update inventories of federal lands and waters and EIA should forecast development timelines and peak output levels that can form a baseline against which to measure achieved production increases. States should be granted permitting authority over lands within their borders and clear procedures and timelines should be established for permitting processes that remain at the federal level.

In addition, downstream timelines must be shortened. Not only does it take years or decades for new resources to come online, but it can take just as long to construct the infrastructure needed to transport and use the resulting fuel. Pipelines and export terminals for both oil and natural gas should be deemed in the national interest and subject to a straightforward approval process with a clear timeline. Energy products should be placed on the same legal footing as other commodities for export. And environmental laws should be amended to eliminate the heightened “new source” burdens that new and expanded power plants, refineries, and manufacturing facilities face as compared to existing ones.

If the question is what resources will America and the world need ten, twenty, or thirty years from now, the answer is that no one knows. But if the question is what course to pursue, we do know: innovation and exploration have always benefited the nation and in hindsight we are always glad they occurred. The moment when new supply seems least critical is no less a moment when future investment should be invited.

The energy revolution unleashed by new oil and gas production on private lands has brought enormous benefits to the America’s economy, its geopolitical power, and its household budgets. This nation has the resources under federal lands and waters to repeat that experience. But the necessary long-term planning and investment will only occur if the federal government replicates the stable and supportive framework that private industry has encountered on private and state-controlled land.

Thank you again for the opportunity to appear before the Committee. I hope my testimony will be helpful to you as you consider appropriate federal energy policy in the context of fluctuating energy prices.

The CHAIRMAN. Thank you, Mr. Cass.
Ms. Minter, welcome.

**STATEMENT OF SUZANNE MINTER, MANAGER, OIL AND GAS
CONSULTING, PLATTS ANALYTICS**

Ms. MINTER. Good morning and thank you for inviting me to share the views of Platts Analytics, the forecasting and analytics unit of Platts division of McGraw Hill Financial. As a Manager in oil and gas consulting, my primary work pertains to global crude oil and liquids dynamics with a focus on global upstream investment, trade flow dynamics and supply trends. I have over 30 years of experience in the energy industry across multiple commodities including natural gas, power and crude oil.

As we sit in the second quarter of 2016, the U.S. energy producer continues to navigate his way through a volatile and overall low price environment. After reaching the most current peak of \$107 in the summer of 2014, crude prices fell swiftly and steeply into the end of 2014, and with a brief exception during 2015, have remained well below \$50, ultimately reaching \$26 this last February.

This price environment has dramatically affected producer and service company balance sheets as well as spending and producing behavior. It is believed that in 2015 the average producer recognized capital expenditure cuts of 35 percent at an incremental 40 percent in 2016. In hindsight it is obvious to all involved that the current price environment is indicative of an extremely over-supplied global energy market.

The shale revolution, which began with natural gas, allowed the U.S. producer to increase nat gas production by 25 percent in just five years between 2010 and 2015. As this technology that drove natural gas production found its way into the oil fields it allowed an even more staggering 57 percent increase in oil production in just three years between 2012 and 2015. When one combines oil, liquids and natural gas production, the U.S. has introduced 8.3 million barrels of oil equivalent into the global market since 2010.

Despite the fact that prices have fallen over 75 percent, global energy production has continued to grow. Since January 2014 the International Energy Agency estimates that global oil and liquids production grew by 5.8 million barrels a day with the U.S. contributing 2.1 million barrels of that growth. The remaining volumes have come primarily from Saudi Arabia and Iraq for a combined 1.9 million barrels and the other 2.1 come from other countries in aggregate.

This is where it becomes very important to consider that, while the U.S. producer is primarily motivated by his own balance sheet, for the most part our global competition produces primarily for revenues. When one considers the contribution of GDP of energy production to OPEC nations in other countries with national oil companies it is apparent that the economic decisions that drive production in these regions are not the same as those of the U.S. independent producer.

Given the fact that they are currently receiving less than half of the revenues per barrel of oil produced as they were as recently of June 2014, basic math says that these countries need to create and

sell more volumes at current low price levels in order to keep their economies viable.

Since the collapse of U.S. prices, the U.S. producer has developed more technical prowess than anyone could have imagined in such a short period of time. We have seen the rate count fall over 80 percent from all-time highs to all-time lows, yet the production response to date has been quite muted.

The remaining rig fleet sits atop the best known acreage and resultant over the past 20 months in many basins initial production rates have increased by 50 percent while drill times have decreased 25 percent. These two factors are among the major determinants of how much production a producer can get from his acreage with the rigs available to him.

The other key item to consider, aside from rig count, is the rate at which producers are completing wells they are drilling. In order to manage the reduced CAPEX budgets many producers are drilling but not completing all of the wells they drill. We believe that producers are completing enough wells to hold production flat during 2016 and intentionally creating an inventory of drilled but uncompleted wells, known as DUC, that they will carry into 2017 in hopes of completing them in a future higher price environment.

This growing DUC inventory holds reserves that can be brought online in a short period of time which in turn, defines the concept of spare capacity.

The global energy market, as broad as it is, is a closed physical environment where ultimately supply and demand must balance for the market to function properly. The current price environment is sending a signal to producers as witnessed by the balance sheets here in the U.S. and to revenues globally that production must slow and allow demand to catch up with the glut of energy that has been introduced into the market in such a short period of time.

Platts expects there to be an even flow in the recovery, both price wise and volumetrically. Until we find balance and a way to manage supply growth with demand growth, the recovery for all will be tenuous.

However, due to spare capacity and the unique economic environment which drives producer activity, it is believed that the U.S. producer may be best positioned to lead the recovery and bolster economic growth.

I'm happy to provide any more information on any of these issues discussed here today or any other questions offered during this session.

Thank you.

[The prepared statement of Ms. Minter follows:]

Testimony of
Suzanne Minter
Manager, Oil and Gas Consulting
Platts Analytics
before the
U.S. Senate Energy and Natural Resources Committee
Hearing to examine challenges and opportunities for oil and gas development in different price
environments

April 19, 2016

Chairman Murkowski, Ranking Member Cantwell, and members of the Committee, good morning and thank you for inviting me to present the analysis of Platts Analytics regarding oil and gas development in the current low-price environment.

My name is Suzanne Minter, and I am Manager of Oil & Gas Consulting at Platts Analytics, a division of McGraw Hill Financial. In this role I manage projects pertaining to global crude oil and liquids dynamics, with a focus on global upstream investments, trade flow dynamics, and supply trends. I have over 30 years of experience in the energy industry including marketing and trading natural gas, power and crude oil.

Platts Analytics provides analytics and forecasting and is a unit of Platts, the leading independent provider of information and benchmark prices for the commodities and energy markets. Customers in over 150 countries look to Platts' expertise in news, pricing and analytics to deliver greater transparency and efficiency to markets and help them make better informed trading and business decisions.

The face of US energy production has changed dramatically over the last decade with the so called "Shale Revolution". Since 2010 the US has grown natural gas production 25% from an annual average of 58 BCF/d (billion cubic feet) to an annual average of 72 BCF/d in 2015.

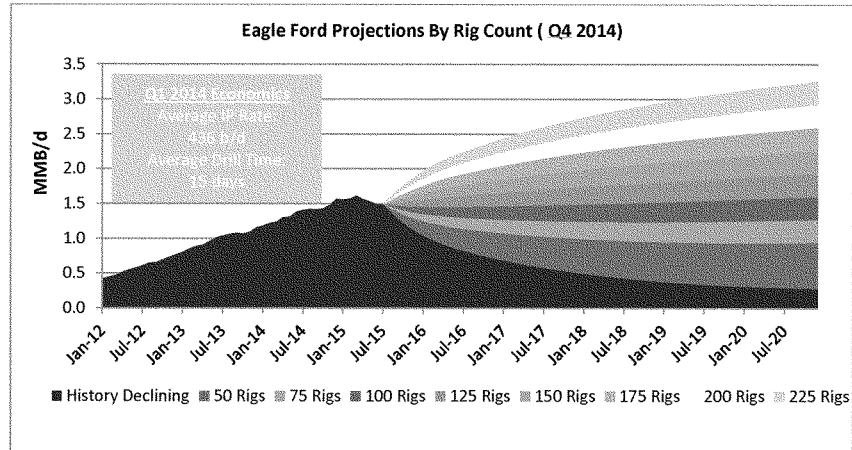
In 2012 the technology that drove natural gas growth found its way onto the oil space. Since January 2012 US oil production grew by 57% from 6.1 MMB/d (million barrels per day) to reach a peak of 9.7 MMB/d in April of 2015. As I will reference during this testimony, all energy production, be it natural gas, natural gas liquids or oil is entwined. For purposes of this testimony I will focus primarily on crude oil.

After reaching a recent peak in June, 2014 of \$107.73, North American crude prices, generally benchmarked as West Texas Intermediate (WTI), fell 76% to reach a low of \$26.05 in February 2016. The first leg of this overall move lower was a precipitous drop in pricing from \$107.73 to \$42.03 that occurred from June, 2014 to March, 2015. In a mere 250 days, prices fell 55% from a multiyear average of \$96.93 (Average prices assessed by Platts from January 2012 to June 2014). As we look at the current global energy market, it is clear that this price collapse is indicative of global over supply. However, the rapidity and steepness of this price action caught

many in the producing and investment community off guard and caused dramatic changes in producer behavior and balance sheets.

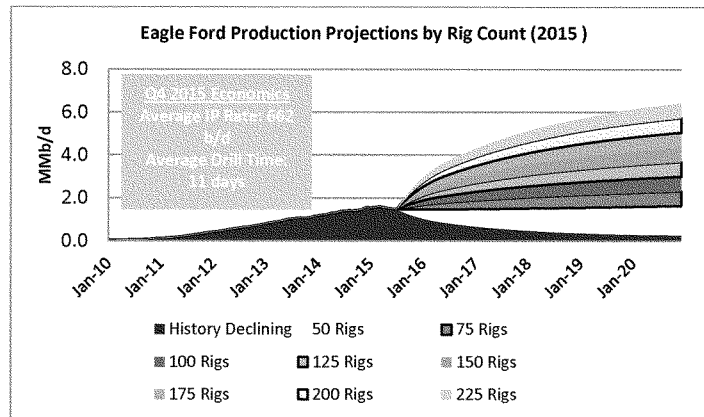
As a result of this price movement, producers have been forced to cut Capital Expenditure (CAPEX) plans dramatically. 2015 saw average CAPEX cuts by producers of 35% as they reduced their drilling plans and slashed the rig fleet. As of April 2016, the US rig count stands at 443, an all-time recorded low, down 80% from the all-time peak of 2,144 achieved in October, 2014. After a 14-month persistently low-priced environment, producers entered 2016 with further estimated CAPEX cuts of 40%. Clearly it is not just the producer that suffers in this environment but all associated services that are impacted by the rig count. The most amazing piece of this entire story though, is that despite the annihilation of the rig count, US crude production has yet to show dramatic declines. The U.S. Energy Information Administration (EIA) estimates that US production peaked in April of 2015 at 9.7 million barrels per day (MMB/d) and currently is estimated to be at 9.2 million b/d – a decline of 500,000 b/d or 5%. This phenomenon was made possible by the fact that as they cut CAPEX, producers were able to capture huge cost savings from the services sector (Platts Analytics estimates there was an average cost savings of 35% across US producing basins in 2015). At the same time, they recognized impressive gains in technology. A quantifiable explanation of “technology gains” can be described as follows:

I will use the Eagle Ford Basin of Texas as an example. Currently the Eagle Ford accounts for 13% of US crude production. In October, 2014 the rig count in the Eagle Ford peaked at 209 rigs. At that time, the average initial production (IP) rate for a well in the Eagle Ford was 436 barrels of crude per day and the average time it took to drill a well was 15 days. At that time, those 209 rigs, should they have remained in the basin, and continued to drill at that rate of one well every 15 days, would have ultimately produced 3.3 MMB/d of crude in the Eagle Ford by 2020.



Source: Platts Analytics

In 2015 as producers cut their rig fleets, the rigs remaining now sit on the best known acreage. Resultantly, the average IP rate in the Eagle Ford increased by 50% to 662 barrels of crude per day and average drill times have fallen by 25% to 11 days. As a result, the current rig count of 49 in the Eagle Ford could theoretically hold production flat at the current estimated level of 1 MMB/d, so long as those 49 rigs stay in the basin through 2020 and continue to drill one well each every 11 days with an IP rate of 662 barrels each. This also means, that when recovery occurs, the Eagle Ford would only require 125 rigs to create the 3.3 MMB/d previously projected by 2020 that had once required 209 rigs to produce.



Source: Platts Analytics

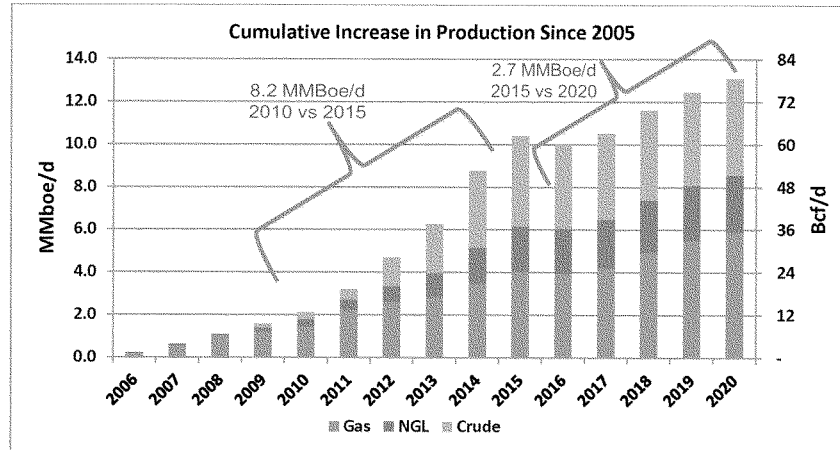
The contingency on these types of production scenarios is that all wells drilled are completed and brought on line in a linear fashion. Data analyzed by Platts Analytics from Rig Data shows that not all wells being drilled are producing oil immediately. In this new reduced CAPEX environment, producer behavior has changed dramatically, even beyond the slashing of the rig fleet.

From review of the quarterly and annual reports of publically traded companies, it is estimated that 40% of the cost of a multimillion dollar well goes into the actual drilling of the well and 60% of the cost goes into the completion of that well, the process of piping and hydraulic fracturing, or “fracking,” that allows for production to actually begin. Platts Analytics estimates that since 2015, a decreasing amount of wells drilled have been completed, and that in between 50-75% of wells are being completed. Producer presentations and quarterly reports of publically traded companies are stating that those producers with still-intact and relatively healthy balance sheets are completing enough wells to hold production flat during 2016 and are intentionally creating an inventory of drilled but uncompleted (DUC) wells that they will carry into 2017 in hopes of completing them in a higher price environment thereby recognizing greater revenues in the future. This DUC inventory will have significant implications for production and the price recovery in the near to midterm.

Platts Analytics estimates there are currently in excess of 6,500 DUC wells in inventory as of December 2015. (Due to lag in reporting of state level data, this is the most recent estimate we are able to compile.) As mentioned, there is reason to believe that this DUC inventory has increased dramatically in the last six months and will continue to do so over the next six months.

Approximately 2,500 DUC wells reside in Texas alone and those are presumed to be oil wells in the Eagle Ford and Permian basins. Assuming an average IP rate of only 500 barrels per day, it can be deduced that if producers made the decision to complete all of those wells at one time, Texas alone could introduce 1.25 MMB/d of oil into the global market. This oil, sitting in the ground, with the potential to hit the market in a short period of time (an estimate of current completion time is an average of 30 days) is known as “spare capacity.” Platts Analytics believes that in the current global energy producing community, the US has the greatest amount of spare capacity.

It is very important to consider that the US energy story is 1) not only a crude story, and 2) not only a US story. In the last decade, the US has introduced 8.3 MMBoe/d (million barrels of energy equivalent per day) into the global market when one considers production of crude, natural gas and natural gas liquids. Even in the current environment of dramatically slowed producer activity and low prices, Platts Analytics believes the US producer is on target to introduce an incremental 2.7 MMBoe/d into the global markets by 2020. For reference, we estimate that the global market is approximately 145 MMBoe/d, so while introduction of these barrels was not extraordinarily large from a percentage basis, the time and the rate in which this energy entered the market appears to have stressed the system in ways unimagined.



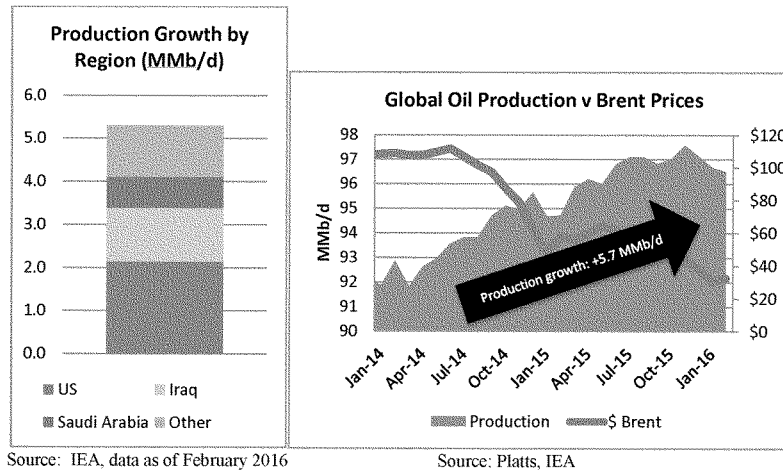
Source: Platts Analytics NG Market Call Long Term, NGL Market Call, and Crude Oil Market Call

While production numbers are the “headline number” and what drive producer profits and revenues, it is important to realize that barrels of crude produced are merely feedstock that will be refined and turned into product to be consumed both here in the US and abroad. While the lifting of the export ban in December 2015 is only a recent event, the US has been an exporter of crude via refined products created for decades and became a net exporter of crude via refined products in 2012.

As startling as the collapse of crude prices has been, what is even more telling of the global oversupply of energy is the accompanying collapse of refined product prices recognized by refiners. On an annual average in 2015, refiners at the US gulf coast, which represents approximately 75% of US refining capacity, recognized average margins of \$9.35 for each barrel of crude refined. This represents an increase of 8% over 2014 averages of \$8.64. However, feedstock costs, (as proxy to WTI) fell over 60% during that same time period. This price phenomenon, coupled with swelling refined product inventories, (per the EIA, refined product inventory currently sits at 827 million barrels, near an all-time high and 85 million barrels higher than this period last year and 132 million barrels or 20% higher than the 5 year average) clearly illustrates that even though prices for products fell significantly during this period, global markets did not appear willing or able to absorb what was being created. This trend in collapsing refined product margin appears to be accelerating, as witnessed by the fact that 2016 year-to-date margins at the US gulf coast, have averaged a mere \$3.11 per barrel versus \$10.69 for the same period in 2015.

Since January 2014, the International Energy Agency (IEA) estimates that global crude and liquids supply has grown by 5.8 MMB/d with US production accounting for 2.1 MMB/d of the total. Saudi Arabia is estimated to have contributed .7MMB/d, Iraq 1.2 MMB/d and other nations in aggregate 2.1 MMB/d. At first consideration, this inverse relationship between low

prices and higher production may appear illogical, but upon further consideration of the economic decisions that drive production here in the US versus the rest of the globe, it may not be as illogical as it appears and actually defines the brunt of the problem for the US producer who is attempting to survive in an oversupplied global environment.



Here in the US, there are an estimated 9,000 individual entities that are producing energy. These parties behave in their own best interest. As oil prices fell, producers kept producing, and will continue to do so as long as it makes economic sense for their balance sheet. As previously mentioned, efficiencies like cost savings from the service sector, coupled with potential financial hedges that may have been put in place, have allowed the US producer to keep producing at prices lower than anyone would have assumed possible. Now that we have existed in this low-price environment for an extended period of time, the US producer is starting to show strain to its balance sheet and accordingly, production is beginning to decline and is expected to continue to do so in the near term. The independent US producer is unique in the global energy market in that it is driven solely by individual profit. At the same time it contributes a minority share of production, approximately 13% of total global liquids supply. Also notable is that energy only contributes a small portion of overall GDP in the US.

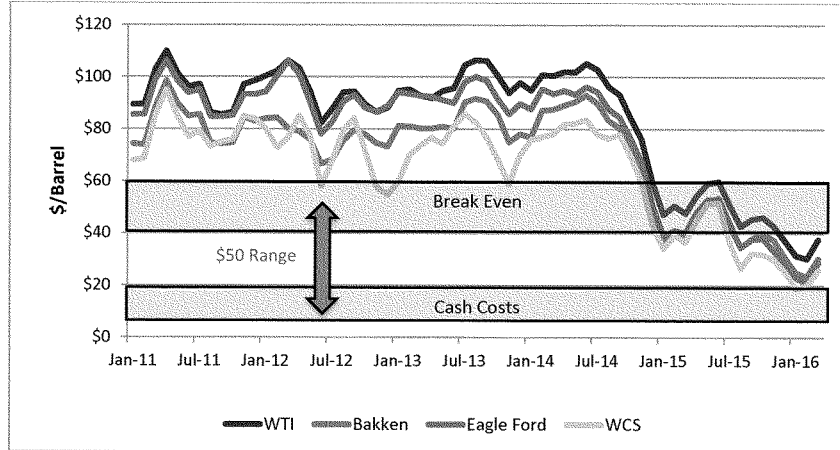
As a general rule, National Oil Companies (NOC) on the other hand, produce for revenue, not profit. When one considers the GDP profile/impact of energy production of OPEC nations it should become apparent that the economic decisions that drive production in these regions are not the same as those of the independent US producer.

Despite the fact that the US producer has illustrated that its technological prowess has allowed it to remain profitable from a balance sheet stand point, the reality is, the US producer still has to purchase or lease the land it drills. This is in direct contrast to an NOC who not only owns the

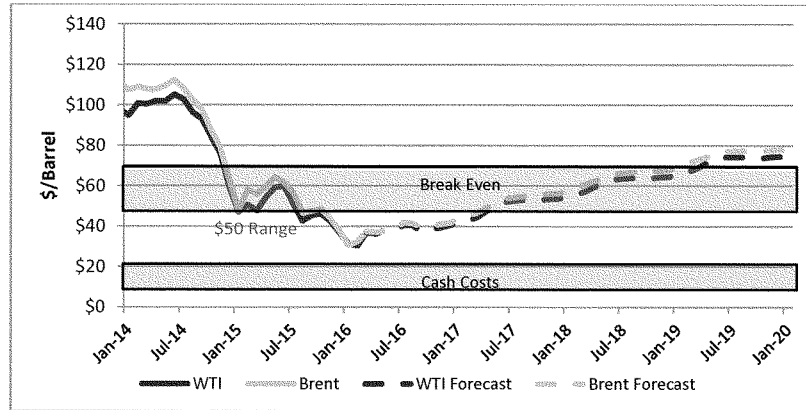
land and therefore the production that is extracted from it, but also often owns a refining complex that creates refined barrels that US refined barrels compete with in the global market place. Aside from this difference though, the revenues that are raised from energy production and sales are what funds the majority of these countries' national economies. Given the fact that they are currently receiving 25% of the revenues per barrel of oil produced as they were as recently as June 2014, basic math says these counties need to create and sell more volumes at current low prices in order to keep their economies viable.

As previously alluded to, the recent surge in global energy growth appears to have overwhelmed recent demand growth. While it is apparent we are currently sitting in a globally oversupplied world from an energy perspective, one has to believe that the energy markets will balance, more than likely in the near term as a supply-side response. Once that balance appears in the marketplace, going forward, natural demand growth will require that additional production be introduced back into the marketplace to meet demand.

In the near/mid-term, it will be the US producer that is the marginal supplier and price setter into the global market. Given the fact that it is believed that the US holds the largest spare capacity to produce incremental oil in the form of the growing DUC inventory which holds reserves that can be brought on line in a short period of time, it is the US producer, and their financial determination of what price point is adequate for their balance sheet, that will dictate the time and price that US production will be reintroduced in to the market. Clearly current prices have slowed production activity and we believe that many US producers are operating near cash costs. As explained previously, for the US producer who is ultimately driven by profit, not revenue, this type of behavior is unmaintainable for an indefinite amount of time. Resultantly, Platts Analytics oil price forecast expects a price recovery in the back years to incentivize production to come back on line.



Source: Platts/Platts Analytics



Source: Platts/Platts Analytics Oil Market Call April, 2016

Despite the fact that energy production is an expensive undertaking, we currently estimate that the prices needed by the US producer to complete their DUC inventory may be much lower than our global competitors believe or would like it to be. As previously mentioned, the DUC inventory is a result of wells that have been drilled, which results in “sunk” costs of 40% of drilling costs. Therefore, a producer may decide to complete his well at lower prices than previously required or expected in order to 1) recapture that “sunk” cost and 2) generate cash flows and revenue. While each producer will behave differently than the next, it seems realistic to assume that when producers are able to recognize WTI pricing in the mid \$40-\$50 range they will bring incremental volumes back in to the market place.

Platts Analytics expects there to be an ebb and flow in the recovery, both pricewise and volumetrically. If too much production hits the market all at once, we will quickly find ourselves in an oversupply situation once again. If the US producer is the one to introduce too many incremental barrels into the market place, we may see a surge in global barrels at the same time as all parties involved compete for market share. Until we find balance and a way to manage supply growth with global demand growth, the recovery for all will be tenuous. However, due to spare capacity and the unique economic environment which drives producer activity, it may very well be that the US producer is best positioned to lead the recovery and bolster economic growth.

The CHAIRMAN. Thank you, Ms. Minter, I appreciate it.
Ms. Palti-Guzman?

**STATEMENT OF LESLIE PALTIGUZMAN, DIRECTOR, GLOBAL
GAS, THE RAPIDAN GROUP LLC**

Ms. PALTIGUZMAN. Chairman Murkowski, Ranking Member Cantwell, Senator Heinrich and members of the Committee, my name is Leslie Palti-Guzman and I'm the Director of Global Gas at the Rapidan Group, an independent energy market, policy and geopolitical consulting firm based in Bethesda with a representation in New York, where I'm based. I'm very honored to speak with you today.

As a European gas analyst, who is familiar with EU energy security and as a U.S. resident for the past ten years who has witnessed the transformative U.S. energy boom and what it means for the rest of the world, I will focus my remarks on the new global gas order that has emerged and what it means for U.S. LNG exports, global gas trade and the geopolitics of gas.

Three main drivers have ushered the new global gas order since the second half of 2014. One, low oil index gas prices as a result of large oil prices decline. Two, rock bottom European and Asian spot gas prices as a result of the evidence of new LNG supply. Three, all of this is happening at a time when demand has been disappointing notably in traditional Asian markets.

As a result, we see LNG buyers' market with greater flexibility, a growing competition between exporters, the entry of more diverse LNG players, a convergence of European and Asian gas prices below \$5 per million BTU, and the wait and see approach when it comes to new investments for new infrastructure. What does it mean for U.S. LNG? In retrospect permitting, contracting and financing U.S. shale to LNG facilities was the easy part. Now U.S. LNG needs to sell.

The current market environment could make the U.S. shale to LNG market less attractive along with its unique Henry Hub pricing. U.S. LNG is all about flexibility which has made U.S. LNG very attractive to purchasers, but at the same time it creates unpredictability for market players, governments and market forecasters in two regards. First, the amount of future exports. Second, their destination.

Regarding the volume uncertainty how much of U.S. LNG will eventually be exported? Due to flexible contract agreements there is no guarantee that the customers of U.S. LNG facilities will export the gas if the economics do not work. If there is high global demand for LNG, U.S. LNG will run at a high utilization rate. If there is low demand, U.S. LNG exports will be cut.

Second, uncertainty is the destination. Current narrowing regional spreads makes Asia a less popular destination for U.S. LNG which will benefit to other consumer centers around the world.

What about the next wave of U.S. LNG investments? I believe that the most critical element to watch in determining whether the world needs additional U.S. LNG is demand for LNG.

In many countries natural gas must compete for market share with cheaper coal and zero emission renewables which makes the future LNG demand uncertain. Post Cop 21 has raised the profile

of gas as the best partner to a greener economy but prices matter. Gas and LNG have to remain competitive.

True, more affordable gas creates renewed or new appetite in several countries. It makes also the environmental argument of favoring gas over coal or fuel oil more compelling. Opportunistic demand for spot LNG is on the rise in new niche markets or even higher risk markets due to cheaper and wider availability of non-long term LNG supply as well as extended use of new technologies such as floating storage and regasification units. However, demand for those new importers could be fickle if prices rebound and some alternative gas supplies or displaced natural gas with competing fuels.

That said, I believe the U.S. LNG plays will continue to be attractive for new investment decision given their low costs, unique pricing and stable source of supply; however, it is important to keep in mind that Asian and European buyers like to diversify their sources and pricing exposure which implies that they don't solely want U.S. LNG only in their portfolio.

When it comes to the geopolitics of gas current structural overcapacity mitigates the risk of any isolated geopolitical event that could disrupt the LNG flow. In addition, the rise of more geopolitical stable suppliers such as Australia and the U.S. reduce the exposure of global gas market to geopolitical disruptions.

The more liquid, competitive and transparent the market is, the more consumers will accept this new notion of energy security that LNG brings that is not related to a land pipeline or additional storage capacity.

Also, the more liquid the market is, the more steady suppliers such as Qatar and Russia will continue to adapt their pricing downward and offer more flexible terms which in turn, will improve the odds of the golden age of gas beyond the U.S.

Thank you.

[The prepared statement of Ms. Palti-Guzman follows:]



United States Senate Committee on Energy and Natural Resources

Hearing entitled “Challenges and Opportunities for Oil and Gas development in Different Price Environments”

Written Testimony of Leslie Palti-Guzman
Director, Global Gas, The Rapidan Group LLC

April 19, 2016

Chairman Murkowski, Ranking Member Cantwell, and Members of the Committee, my name is Leslie Palti-Guzman and I am the Director of Global Gas at The Rapidan Group, an independent energy market, policy, and geopolitical consulting firm based in Bethesda, Maryland, with a representation in New York where I am based. It is an honor to speak with you today about the changing price environments and what it means for natural gas and LNG developments.

As a European gas analyst, who is familiar with EU energy security, and as a US resident for the past ten years who has witnessed the transformative US energy boom and what it means for the rest of the world, I will focus my remarks on the new global gas order that has emerged since the second half of 2014 and what it means for US LNG exports, global gas trade and the geopolitics of gas.

A New Global Gas Order

Large oil price declines reflected in oil-indexed gas prices (notably in Asia), abundance of new LNG supply and European and Asian rock bottom spot prices at a time when traditional Asian demand is muted, have ushered in a new order for LNG markets.

The 2016 global gas market features a buyer’s market with greater flexibility, growing competition between exporters, entry of more diverse LNG players, a convergence of European and Asian spot prices below \$5/mmbtu, and a wait-and see approach on LNG infrastructure investments.

US LNG Needs to Sell

Permitting, contracting and building US shale-to-LNG facilities was in retrospect the easy part, now the US LNG needs to sell. Flexible purchasing agreements, eroding international prices and weakened demand in top LNG consumer country could make the US shale-to-LNG market less attractive than it was a few months ago.

There is no guarantee that the customers of the US’s first shale-to-LNG export facility, Sabine Pass, in Louisiana will not leave the fuel at its port when commercial operations start next month. Roughly 58 million tons of US LNG have been sold under long-term contracts out of the five facilities currently under construction (sufficient to supply the combined LNG markets of Europe and South America), however there is no guarantee that the customers which have contracted the volumes will actually use their option to export the gas if the economics do not work. US LNG is all about flexibility, which has made US LNG appealing to purchasers, but it also means that buyers are free to walk away from previously agreed purchases by giving notice.

Furthermore, buyers are free to send their LNG without a fixed destination attached—meaning that there is no predetermined dedicated market for US exports. The destination of US Gulf Coast LNG, with first commercial cargoes starting in coming weeks, will be determined by regional price spreads. Current narrowing regional spreads make US LNG to Asia unlikely. Whereas about half of all cargoes from new LNG export projects were initially expected to go to Asia, as it stands today, it

seems that 1/3 of US LNG will go to Asia, while possibly 1/3 will be sent to Europe and 1/3 to the rest of the world, notably South America.

Along with its unique Henry-Hub pricing, the newly found flexibility is highly attractive for purchasers, but it also creates unpredictability for market players, governments, and market forecasters regarding the amount of future exports and their destinations.

Next Wave of US LNG Investments

Given the medium-term glut, the market takes a wait-and-see approach when it comes to making major final investment decisions (FIDs). Oil price levels, project cost mitigation, competition between supply sources, and natural gas demand will shape the flow of incremental US supply in the coming years.

FIDs that do go ahead in the next four years will feature either major cost reductions, competitive technologies (such as FLNG), capacity downsizing, or access to a large-scale resource and/or strategic market that makes the project a winner in the long run despite the current, unfavorable market conditions.

US LNG plays will continue to be attractive for new investment decisions (including Greenfield) given their low cost, unique pricing and stable source of supply.

However, it is important to keep in mind that Asian and European buyers like to diversify their sources of supply and pricing exposure, which implies that they don't want solely US LNG in their portfolio. Some in Europe, do not want to replace a Russian dependence by a US dependence. In Asia they want a portfolio as diversified as possible (supply from Russia, Qatar, Australia and others). Delays in other plays (Mozambique, Western Canada) will be a boon for new investments in US LNG. But the most important competition to additional US LNG capacity will be unsold volumes from operational export plants.

Medium-term and long-term demand for LNG will be one of the most critical elements to watch in determining whether the world needs additional US LNG. In many countries, natural gas must compete for market share with cheaper coal and zero-emission renewables, which makes future demand uncertain. In Europe, there is no obviousness in the role of gas and gas cannot compete with coal without a carbon price. Post Cop-21 has raised the profile of gas as the best partner to a greener economy, but prices matter. Gas and LNG have to remain competitive.

More affordable and accessible LNG creates renewed or new appetite in several countries, making also the environmental argument of favoring gas over coal or fuel oil more compelling. As the Asian premium for LNG prices evaporate, large Asian importers such as Japan and South Korea will save billions of dollars on their LNG bills. Cheaper natural gas imports can accelerate switching from coal, a top Chinese priority to address urban pollution.

Moreover opportunistic demand for spot LNG is on the rise. LNG is gaining traction in new niche markets that see it as a stop-gap solution or as a security of supply necessity. New countries have entered the LNG importer club past 2 years (Jordan, Egypt, Pakistan) due to cheaper and wider availability of "non-long-term" LNG supply as well as expanded use of floating storage and regasification units (FSRU) that cut lead time to get in place a LNG import infrastructure (less than 2 years). However, demand from these new, opportunistic importers could be fickle if prices rebound, and some may increase domestic production, secure alternative import supplies, or displace natural gas with competing fuels.

Trends in Global LNG Trade and Pricing

The surge of flexible supply available to the spot market will be a defining feature of medium-term global LNG markets. It will have a transformative impact on the market, which will become freer and more transparent by the end of the decade. While this flexible supply is a boon for buyers, it is a challenge for suppliers in an oversupplied market and will drive intense competition, downward pressure on pricing and doubts regarding the sanctity of long-term contracts.

In addition, oil price gyrations will make oil-gas pricing less predictable, speeding LNG buyers' push away from oil-indexation. At a time when lower pricing and cost inflation put at risk projects and companies are tempted to defer investment, a reform of financing for LNG projects might be needed. Once Hubs will be liquid enough, especially in Asia, investments will increasingly rely on market forces and reliable price signals.

Geopolitics of Gas

The rise of more politically stable suppliers, such as Australia and the US, reduces the exposure of global gas markets to geopolitical disruptions, which means enhanced energy security for consumers.

Current structural overcapacity mitigates the risk that any isolated geopolitical event that disrupts LNG flows would significantly impact pricing near term. A simultaneous cutoff of gas to Europe from Algeria and Libya is our highest probability event for this year, but odds are low. Longer term, Russia's continual threats to long-term gas diversification and the evolution of Qatar-Iran relations pose risks in Europe, the Caspian, and across the Middle East, but near-term disruptions are unlikely.

The more liquid, competitive and transparent the market is, the more established suppliers such as Qatar and Russia will continue to adapt their pricing downward and offer more flexible terms, which in turn will improve the odds of the golden age of gas.

The CHAIRMAN. Thank you.
Mr. Ratner, welcome.

**STATEMENT OF MICHAEL RATNER, SPECIALIST IN ENERGY
POLICY, CONGRESSIONAL RESEARCH SERVICE**

Mr. RATNER. Thank you.

Chairman Murkowski, Ranking Member Cantwell, Senator Heinrich, members of the Committee, my name is Michael Ratner. I'm a specialist in Energy Policy at the Congressional Research Service. CRS appreciates the opportunity to testify on the important issue of oil and natural gas development in different price environments.

In accordance with our statutes CRS takes no position on policy or legislation.

Why prices for oil and gas have declined so drastically in recent years is directly related to the advent of U.S. shale gas production and the application of related techniques to the oil sector.

The drop in oil prices since mid-2014 has attracted a lot of attention and has prompted producers to improve their production methods. This has contributed to the resiliency of U.S. output. U.S. crude oil production in January 2016, the latest data available, remained over nine million barrels per day. Although it was the fourth month of decline, oil prices remained low.

Natural gas is different. U.S. natural gas production continues to rise despite sustained low prices. In January 2016 U.S. natural gas production hit a new monthly high, and in March the United States started exporting liquefied natural gas from the lower 48.

In the United States, oil and natural gas prices are no longer linked. Outside of the United States, contract natural gas prices tend to be indexed oil but that is changing. Prices for both commodities are currently low compared to just five years ago.

Regardless of the price level, some analysts contend that an external cost, such as national security and the environment, are not fully incorporated into the price, although analysts disagree about the magnitude of externalities.

Oil is in the \$40 per barrel range, up recently, but still relatively low. And U.S. natural gas is under \$2 per million British Thermal Units (BTU). One does not have to think back, far back, to when prices for both commodities were much higher. In 2011 oil was close to \$100 per barrel, and natural gas was about \$4 per MMBTU. Also, keep in mind that ten years ago shale gas and tight oil were almost unknown.

Any price assumptions in my testimony are not forecasts, and CRS has not evaluated the likelihood of any scenario.

In a low price environment both oil and natural gas producers, as well as service companies, face financial challenges. Companies have cut capital expenditures, laid off workers, filed for bankruptcy protection, gone into bankruptcy, sold assets or been downgraded by credit agencies. Cutting capital expenditures, in particular, will have effects on production beyond a five-year timeframe, especially in more challenging areas.

However, the responsiveness of shale production could potentially smooth any related price events. The longer prices stay low, the harder it will be for companies to survive. Nevertheless, some companies will remain financially solid and will weather the low

prices better. As prices rise, companies will reassess their strategies.

On the other hand, consumers of all types should benefit from the low prices. Individuals and companies have seen their oil and natural gas related expenses decline. How consumers view the future of oil and natural gas, especially prices, influences their decision on purchasing new equipment that uses oil or natural gas. This will have an impact on future production needs and prices.

As an example, prior to the fall in oil prices there was a lot of discussion on sectors where natural gas could replace oil products, mainly long haul trucking, rail and marine. Now there is less talk of substitution in trucking or rail, although marine remains an area of interest which appears to be driven more by regulation than by prices.

Similarly on electricity, there's been a shift to natural gas by generation verses coal. While this has mostly been an increase in utilization, new construction tends to focus on natural gas or renewables in part because of the regulatory issues and financial incentives.

Oil remains the dominant fuel for transportation and different price levels may affect the fuel efficiency of a car one buys but it is not as likely to significantly influence the fuel type consumed.

There are a variety of other areas that will be affected by high or low prices including related sectors like infrastructure, trade, the environment and geopolitics, among other topics.

As I mentioned, the United States began exporting liquefied natural gas earlier this year. With the lifting of restrictions at the end of last year exporting crude oil from the United States has become easier.

Regarding the environment, they'll be positive and negative consequences that are outside my expertise. For geopolitics, countries that rely on oil and natural gas revenues for their budget have been hurt by low prices. This includes both U.S. allies and adversaries.

Finally, oil and natural gas prices are big economic factors; however, the U.S. economy is well diversified and not reliant on state-controlled energy companies. Nevertheless, some local economies will benefit while others do not, depending upon the scenario.

Thank you for the opportunity to appear before the Committee. I'll be happy to elaborate on my opening remarks and address any questions you may have.

Thank you.

[The prepared statement of Mr. Ratner follows:]



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TESTIMONY

Statement of

Michael Ratner
Specialist in Energy Policy

Before

Committee on Energy and Natural Resources
U.S. Senate

Hearing on

**“Challenges and Opportunities for Oil and
Gas Development in Different Price
Environments”**

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Chairman Murkowski, Ranking Member Cantwell, Members of the Committee, my name is Michael Ratner. I am a Specialist in Energy Policy at the Congressional Research Service. CRS appreciates the opportunity to testify on the important issue of oil and natural gas development in different price environments. In accordance with our enabling statutes, CRS takes no position on policy or legislation.

Introduction

Why prices for oil and natural gas have declined so drastically in recent years is directly related to the advent of U.S. shale gas production and the application of related techniques to the oil sector. The drop in oil prices since mid-2014 has attracted a lot of attention, and has prompted producers to improve their production methods. This has contributed to the resiliency of U.S. output. U.S. crude oil production in January 2016, the latest data available, remained over 9 million barrels per day, although it was the fourth month of decline, while prices remained low. Natural gas is different. U.S. natural gas production continues to rise, despite sustained low prices. In January 2016, U.S. natural gas production hit a new monthly high and in March the United States started exporting liquefied natural gas from the lower-48.

Prices

In the United States, oil and natural gas prices are no longer linked. Outside of the United States, contract natural gas prices tend to be indexed to oil, but that is changing. Prices for both commodities are currently low, compared to just five years ago. Oil is in the \$40 per barrel range, up recently but still relatively low, and U.S. natural gas is under \$2 per million British thermal units (mmBtu). One does not have to think far back to when prices for both were much higher. In 2011, oil was close to \$100 per barrel and natural gas was about \$4 per mmBtu. Also, keep in mind that ten years ago shale gas and tight oil were almost unknown. Any price assumptions in my testimony are not forecasts, and CRS has not evaluated the likelihood of any scenario.

Producers

In a low price environment, both oil and natural gas producers as well as service companies face financial challenges. Companies have cut capital expenditures, laid off workers, filed for bankruptcy protection, sold assets, or been downgraded by credit agencies. Cutting capital expenditures, in particular, will have effects on production beyond the five-year time frame, especially in more challenging areas. However, the responsiveness of shale production could potentially smooth any related price effects. The longer prices stay low the harder it will be for companies to survive. Nevertheless, some companies will remain financially solid and will weather low prices better. As prices rise companies will reassess their strategies.

Consumers

On the other hand, consumers of all types—should benefit from low prices. Individuals and companies have seen their oil and natural gas related expenses decline. How consumers view the future of oil and natural gas, especially prices, influences their decision on purchasing new equipment that uses oil or natural gas. This will have an impact on future production needs and prices. As an example, prior to the fall in oil prices there was a lot of discussion on sectors where natural gas could replace oil products, mainly long-haul trucking, rail, and marine. Now, there is less talk of substitution in trucking or rail, although marine remains an area of interest, which appears to be driven more by regulations than by prices. Similarly on electricity, there has been a shift to natural gas-fired generation versus coal. While this has mostly been an increase in utilization, new construction tends to focus on natural gas or renewables, in part because of regulatory issues and financial incentives. Oil remains the dominant fuel for transportation and different price levels may affect the fuel efficiency of a car one buys, but it is not as likely to significantly influence the fuel type consumed.

Other Issues

There are a variety of other areas that will be affected by high or low prices, including related sectors like infrastructure, trade, the environment, and geopolitics, among other topics. As I mentioned, the United States began exporting LNG earlier this year. With the lifting of restrictions at the end of last year, the United States has also started exporting crude oil. Regarding the environment, there will be positives and negatives consequences that are outside my expertise. For geopolitics, countries that rely on oil and natural gas revenues for their budget have been hurt by low prices. This includes both U.S. allies and adversaries. Finally, oil and natural gas prices are big economic factors; however, the U.S. economy is well diversified and not reliant on state-controlled energy companies. Nevertheless, some local economies will benefit, while others do not depending upon the scenario.

Thank you for the opportunity to appear before the committee. I will be happy to elaborate on my opening remarks and address any questions you may have.

The CHAIRMAN. Thank you, Mr. Ratner. Your final remarks there about certain areas benefiting and others not, when the comment was made earlier that the anticipated average price of fuel here in the country is going to be \$2.04 a gallon, I am reminded that in about 80 percent of my communities that are not attached by road and their fuel is either flown in or barged in, they are going to still be looking at \$5, \$5.50 a gallon. So we do not all enjoy the same benefits.

I want to talk about LNG just for a moment. I mentioned the Energy 20/20 white paper that we put out in 2013. At that time I had said that there was this narrowing window of opportunity for LNG exports because of all the things that many of you have said here today, and a recognition that for Alaska with the LNG that we have historically exported. For 40 years we exported limited amounts to Japan, and I mentioned that we have exceptions to some of what we are able to produce in Alaska for a host of different reasons.

I have always said that our LNG opportunities are also subject to narrow window. We are pushing very hard to try to get our natural gas to market, but we have some logistical challenges that we are dealing with.

In the meantime, the politics, the geopolitics, of LNG are playing out. The issues that you have mentioned, Ms. Palti-Guzman, are ones that I am particularly paying attention to and recognize that how we are viewed, we, being Alaska, may be different than the resource that comes from the lower 48 in terms of the markets that we might be attractive to. And you indicate that Asia looks to be a less popular U.S. destination.

I am curious, and I would direct this question both to you and to Mr. Ratner, in terms of Alaska's LNG opportunities, do you view that through a different lens than LNG, other domestic sources of LNG, or is it all in the same pot? Either one? Ms. Palti-Guzman?

Ms. PALTI-GUZMAN. Thank you for your question.

I think if you look globally at all supply of LNG port and shale supply of LNG, there will be stranded assets because there is too much of it. Now the projects that are going to go ahead are the ones that will manage to make cost mitigations, that will have customers already on board.

When I look at Alaska we need to think about Asia, and Asia is not one block. The traditional buyers in Asia, Japan, South Korea, have declining demand or stagnating demand. But there are also a lot of uncertainties, and Japan's may be related to the restarts of nuclear reactors and they are undergoing their regulation in their own markets. India and China, the two emerging economies, have huge upside for LNG demand, and then there is Southeast Asia that is a growing niche market. So when we look at Asia we need to distinguish between those different markets. And I still think that they are the growth motor for LNG demand globally. But we've seen in 2015 that their share in the global gas trade declined from 75 percent to 72 percent and maybe was related to slowdown in demand in China because of the slowdown of the economy but also less demand in South Korea and Japan.

The CHAIRMAN. Let me ask Mr. Ratner.

Mr. RATNER. Sure. Thank you for the question.

I mean, when it comes to Alaska, as you indicated, it is viewed as different for a gas, and DOE has said that in their permitting process when they granted permits for Alaskan projects.

And I think that the, as far as, Asia is definitely the most logical market given the proximity of Alaskan gas. And I think, one of the things looking forward, is also that any new project in Alaska is not going to be entering the market in the next two years. It's going to be entering further out.

And so, we need to see how the current low prices will affect demand globally, particularly in Asia. But that those are going to be factors of what type of market is—will the Alaskan gas, if it gets built, will it be entering at that time.

And so, I would expect that any new project in Alaska is going to take a good number of years to build the pipeline, build a facility, go through the permitting, etcetera, before it hits the market.

And I think, going forward, if you look at the current low prices, that's going to have a big impact on countries that may view, that currently don't import LNG, but may view it as an alternative fuel in the future that may benefit potential exports from Alaska.

The CHAIRMAN. This is just part of the struggle we have. People look at the prices today and say, well this is a lousy time to make such an investment. And as I have mentioned, whether you are talking oil and the potential within ANWR or eight to 12 years to build a pipeline that we are talking about for LNG, is again, about an eight to ten-year prospect for a \$50 billion project.

So how you marry this up, get people away from the imperative of now and the concern over prices now and focused on where we are going to be a decade from now in terms of our need and our demand is a big challenge for us.

Let me go to my colleague, Senator Heinrich.

Senator HEINRICH. Thank you, Chairman.

Ms. Palti-Guzman, the four corners region in my state is heavily invested in the natural gas industry. Because of the oversupply that you mentioned, gas prices have now been very low for some time. The region is going through some difficult economic times, as you can imagine. With gas prices continuing to hover around \$2 per million BTU, something like a fourth of the existing wells in San Juan County are losing money today. You can imagine people working in that industry in my state are hurting.

What are the prospects and the opportunities for places like San Juan County that gas prices will soon return to more profitable levels? In particular, do you expect the increase in the use of combined cycle combustion turbines for electric power generation or the increases in natural gas exports to impact those prices?

Ms. PALTIGUZMAN. I definitely think that exports, you know, natural gas producers are looking for new outlets and more outlets. There is so much gas around.

And so, U.S. LNG exports there have already started, that was yesterday at the ceremony for the opening of Sabine Pass, they have already sent seven cargos and then commercial operation will start. But we need to wait for another two years before the second liquefaction plans start.

In the next two years there will be the ramp up of the Sabine Pass liquefaction plant, but the big increase in U.S. LNG exports

will happen beyond 2017. And then there is, at the same time, more pipeline exports to Mexico.

So those are two areas where exports for U.S. natural gas producers that will have an impact on U.S. natural gas production.

Senator HEINRICH. Thank you.

Mr. Bordoff, you mentioned in your testimony recent methane waste regulations, and you stated that methane leaks can be greatly reduced at very low cost. We all know that unburned methane is a powerful climate disruption, pollutant.

Have you had a chance to look at some of the particular rules, in particular, I point you to the Bureau of Land Management's rule on methane waste? And would you expect those to conform to that pattern?

Mr. BORDOFF. I think the regulations that have been proposed do a good job of trying to find the lowest cost opportunities to reduce methane emissions. We know that methane emissions, when the right steps are taken, can be reduced for just pennies on the dollar.

Really good work by the Environmental Defense Fund, many universities and others have found opportunities to find different leaks in the pipeline system, different areas of production and take, you know, take targeted steps that are quite cost effective, again, considering the cost of methane emissions as a fairly potent climate forcer. So I think those are steps that are quite sensible to take where the, you know, benefits exceed the costs.

Senator HEINRICH. Thank you.

Ms. Minter, what do you see as some of the near-term impacts that you would expect on crude prices and refined products as well now that restrictions on exports of crude oil have been removed?

Ms. MINTER. I think it's really important to realize that for all practical purposes the U.S. has been exporting oil as a net export via refined products since 2012.

Senator HEINRICH. Refined products.

Ms. MINTER. So what we're seeing now is refining margins across the board for the U.S. refiner are collapsing as we have this oversupply of refined product.

So allowing exports for crude out the door will probably be helpful to some producers of a particular grade. However, we've really got to resolve the overall glut of refined products that we're finding in inventories and they're also being reflected in low prices before we can recover.

Senator HEINRICH. Madam Chair, in the interest of letting a few more folks get to questions before we go to the floor, I am going to go ahead and give my time back.

The CHAIRMAN. Senator Cassidy?

Senator CASSIDY. Ms. Minter and maybe Mr. Bordoff, I am struck by the fact that it is easy to look at the capital expenditures and all the infrastructure in the DUCs. I would have said ducks, so thank you for making it clear.

But the one thing I have heard consistently and see articles pertaining to is that we are also losing a work force. That folks who have gone to North Dakota to work in the Bakken may decide they don't wish to stay there. Because the prices have fallen now, they have moved back. They marry, whatever.

Do you have any comments upon the age of our current work force and the difficulty in replacing well-trained workers with those who have previously not been trained?

Ms. Minter first.

Ms. MINTER. There is definitely some concern in how quickly we're able to respond when the price signal comes. As producers and service companies sit in this low price environment for a longer and longer period of time, producers may not have adequate cash to address the price signal when it comes to bring production back on. And resultingly, we may not have adequate, you may not have the ability to bring qualified crews back in, in a quick period of time.

If that's the case where we go longer and longer in between the cycle of, you know, ramping production up and keeping it and dropping it back down, you could potentially see more extreme price spikes as producers have to throw money, really, out into the work force to bring back qualified workers.

Senator CASSIDY. So even the presence of these drill but not completed or uncompleted, we would still be susceptible to that because those are only on the cusp of production but nonetheless without an adequate work force even those might not be quickly?

Ms. MINTER. Right.

And I think, like I said, what I was trying to say, is I think it's going to be a function of the amount of time that we sit in this low price environment. There's real potential that the commodity cycles can become very shortened. You know, given the recent price rise we've seen lately to this low 40s price area, it would not surprise me to see some producers actually have production coming back on right now from these docks which in turn will force us to slow back down. However, if we sit in a sub 40 price environment for a year or 18 months then you're absolutely right, there could be a risk of losing.

Senator CASSIDY. So there is one theory that the Saudis are doing this on purpose to drive out, not just our shale production, but also to make non-profitable our offshore work. The offshore work, of course, continues to produce no matter, and that is the bigger threat to the Saudis, so some say.

In a sense, if that is true, just imagine that it is, the Saudis sort of predatory pricing is actually not only hurting those 750,000 people who are employed but it is actually subjecting our economy to greater risk for price spikes going forward. Fair statement?

Ms. MINTER. I think it's a fair statement to say that we are in a very competitive global market and right now producer behavior across the globe is one of everybody trying to get their market share any way they can.

On those offshore projects that you referenced, they do produce and they will produce. In the long run they are much more capital intensive projects and they are longer-term projects.

Senator CASSIDY. So in a sense, those are a better hedge against future price spikes because they are going to produce no matter what.

Ms. MINTER. Possibly, yeah.

Senator CASSIDY. Yes. Again, that would probably be the reason for us to think about that.

Mr. Bordoff, similarly, you said that we should not allow current pricing to dictate that. Would you agree that we should remain interested in those outer continental shelf projects with such tremendous capital expenditures to develop that are going to produce?

Mr. BORDOFF. Well I mean, I would leave it to the companies that are investing billions of dollars in capital to, you know, make a decision about whether they're interested in these——

Senator CASSIDY. The only reason I say that, by the way, is that it is also Federal policy. Mr. Cass references that, but Secretary Jewell recently said now is not the time to begin producing oil off the Atlantic Coast.

I think it is, kind of, among other things, ignoring the time frame it calls to develop such things. I'm sorry, continue.

Mr. BORDOFF. Yes, no, no.

I think the point, I mean, the first thing I would say is I think the honest answer is we don't totally know because we've never been through an extreme boom/bust cycle in the area of tight oil production before. And it's a really——

Senator CASSIDY. Boom/bust?

Mr. BORDOFF. Shale oil, right? So the question of how quickly at what price does it take for U.S. tight oil production to start growing again, on average. The Basin is very different, and how long does that take to restart is an open question.

But I think it can take a little bit longer than some people think, maybe nine months, maybe 12 months because you have to get the capital markets to open back up again. You need the workers to come back and people have moved off to do other things. You need the rigs to come back.

It is true that the drill but uncompleted wells can help. That's probably a slug of a couple hundred thousand barrels a day. So the question is how much do you need shale to——

Senator CASSIDY. Let me stop you on that because I was struck that even though we have this incredible decline in rig count we still have not nearly the same amount of decline in production.

Mr. BORDOFF. Right.

Senator CASSIDY. And so it seems as if those DUCs have a potential, because I am assuming they are doing those in the upgraded or the high graded sites. Ms. Minter, would you agree with that?

Ms. MINTER. Yes, actually we estimate that the DUC inventory, that the spare capacity, could potentially be close to one and a half million barrels a day if all of that production were brought online at one time.

Senator CASSIDY. One and a half million a day?

Ms. MINTER. Barrels, yes.

Senator CASSIDY. Yes.

I'm sorry. Mr. Bordoff, I am over my time, but if you can quickly answer?

Mr. BORDOFF. No, so I think that there are, obviously, different estimates out there about exactly what the total volume of drill but uncompleted volume could be brought online quickly.

So the point I was trying to make was in response to some supply disruption in the world the way, four or five years ago we have a million and a half barrels' loss of Libyan supply with very narrow

margin of spare capacity being held by OPEC, mostly Saudi Arabia now.

Are we in for more price volatility moving forward? And the question is to what extent drilled but uncompleted wells can very quickly come back or high levels of inventory can quickly provide some support. But if you need to wait for the U.S. to respond and that takes six, nine, 12 months, that may mean, as you said, prices sort of over and under shoot which means more volatility moving forward, potentially.

Senator CASSIDY. I yield back. Thank you.

The CHAIRMAN. Thank you, Senator Cassidy.

Just for the information of members, the first vote has started. Again, we will keep the Committee moving through these votes.

Senator Franken?

Senator FRANKEN. Thank you, Madam Chair.

Mr. Bordoff, you write in your testimony about the benefits from widespread use of hydraulic fracturing technology or fracking in the oil and gas sector. These benefits include lower oil and natural gas prices for consumers, of course.

For natural gas the Department of Energy also states that when used in modern, efficient power plants it emits half as much carbon dioxide emissions as coal.

However, we hear a lot about possible downsides of fracking. Many argue that the climate benefits of natural gas electricity generation verses coal is entirely dependent on how much methane leaks, something Senator Heinrich brought up about its potency as a greenhouse gas. Some states and localities have even banned fracking because of concerns about the impacts on the water table and water resources.

What I would like you to do is talk about the tradeoffs of hydraulic fracking as you see it because this is an argument that we are having right now.

Mr. BORDOFF. Yes, and it's a really important one. Thank you for the question, Senator Franken.

It—we've seen over the last five, six, seven years U.S. oil production almost double before it started to recently tail off. We've seen a very large increase in natural gas production. You know, just ten years ago in 2005 the Energy Information Administration projected that this year or last year, in 2015, we'd be importing about 18 or 19 billion cubic feet a day of LNG imports.

And now we just had our first export of LNG, and we'll soon be a net exporter. That has added jobs. It has added a boost to the domestic economy.

I think Ms. Palti-Guzman talked about the potential geopolitical implications that increased, that U.S. LNG exports could have and increased global trade could have in providing more diversity, optionality, sources of supply whether you're in Europe dependent on Russian pipeline gas or in Asia paying very high prices for LNG a couple of years ago.

So there are a host of economic and geopolitical benefits and in some cases we have seen cheap gas as one of the drivers, not the only driver, of displacement of coal which is high pollution, including but not limited to, carbon benefits here in the U.S.

There are really important and very valid concerns that have been raised about the environmental impacts of shale production. They need to be understood, better than they are today. They need to be properly regulated.

We need different states and localities to reach different judgments about the level of risk that they're going to decide to accept and different places have different risk associated with them.

And whether it's the risk of moving a lot of oil by rail or the risk of seismic activity, if you're doing underground injection of waste water, other things. These are real important issues that shouldn't be dismissed with the right set of regulations, with better understanding and with really good, local, State and Federal, there is a Federal role to play, in regulating this activity to make sure it's done safely and responsibly. Hopefully we can find that right trade-off between the risks and the benefits.

Senator FRANKEN. Sure.

One of the other tradeoffs, I mean, it is replacing coal in many coal-fired plants. Is an over reliance on cheap natural gas going to inhibit the deployment of renewable energy generation?

I want to ask Ms. Minter a question. I am interested in your research to break even prices of production or the necessary global market price for companies to make a profit in different geological formations. I noticed in your testimony that the average, break-even price for oil companies drilling in the U.S. shale formations is about \$45 to \$55 per barrel of oil. Is that correct?

Ms. MINTER. What we have heard from producers in conversations with them is that yes, they tell us the break-even prices are between \$45 to \$55 per barrel.

This varies broadly, though, across the U.S. depending upon play and the infrastructure available as well as the quality of oil. Not all oil is the same oil, and lighter oils are actually discounted significantly in the marketplace so those producers will probably need a higher price point to come back on.

Senator FRANKEN. Okay. I see I am out of time, and I know we have votes so I will submit a couple questions for the record.

Ms. MINTER. Thank you.

Senator FRANKEN. If that is okay, Mr. Chairman.

Senator BARRASSO. Absolutely.

Senator FRANKEN. Thank you.

Senator BARRASSO [presiding]. Mr. Bordoff, I want to discuss the effects of the low oil prices nationwide. In your testimony you stated the oil price fall is providing less of a macro economic boost and it may have been anticipated. You explained that while there was some boost to consumer spending from the lower gasoline price, it was much lower than would have been expected. And in the magazine, *The Economist*, it said exactly the same thing that you said. You also said that the net benefit to the U.S. is smaller because the U.S. is such a large producer and that the big employment gains from the shale boom are now being thrown into reverse. Finally, you stated that because the U.S. is a much smaller net oil importer than it was before, when the price falls more of the consumer benefit comes at the expense of domestic producing/producer revenue.

So the question is would you please expand a little bit upon your comments and explain how lower oil prices are providing far fewer economic benefits than in years past?

Mr. BORDOFF. Yeah, thank you for the question, Senator Barrasso.

If you, I think the White House Council of Economic Advisors in a report, recent report, looked at the domestic economic benefit of an oil price drop and there's, sort of, been a rule of thumb that a \$10 move in the price of oil might boost GDP somewhere between 1.1 and 2.0 percentage points. We've seen about a \$50 on average, and it's been larger than that at certain points drop. And they estimated that in 2015, relative to '14, the positive GDP in fact was 0.2 percentage points. So that's small.

And what they broke it down and as the consumer benefit was about 0.5 percentage points which is the low end, but roughly what you'd expect based on the historic rule of thumb. But you—they subtracted from that 0.3 percentage points because of decline in drilling and mining investment. And so partly because consumers coming out of the great recession are saving more of the money they've saved with lower gasoline prices, paying down debt and other things. That's reduced the positive impacts on what, partly because we are a much larger producer and industry is a much larger, is a larger part of the economy. And that's taken a hit.

And then the third part is that because we're a smaller importer when we spend less on gasoline that has a distributional impact between either benefiting or hurting producers or consumers but more of that savings or increased spending on gasoline is circulating within the U.S. economy rather than flowing overseas. So the result of that is that when we have lower gasoline prices consumers save and producers lose.

The flip side is when prices are inevitably going to spike again we're also a little bit more resilient from a macroeconomic perspective because when consumers spend more and more of that increased spending circulates within the U.S. economy.

Senator BARRASSO. Now thinking about your article that you wrote last month for Foreign Affairs, it was titled, "The United States turns on the Gas, the Benign Energy Superpower." In the article you discuss how exports of LNG from the United States will pose serious challenges for Russia. You make a point that over the last several years Russia has placed its bets on vast strategic gas pipeline projects such as the very controversial, the Nord Stream Two, that would connect Russia to Germany bypassing Ukraine.

You go on to say that Russia will try to retain its market share by lowering prices and using its spare production capacity to crowd out U.S. imports from the European market. Many European leaders remain concerned about projects like Nord Stream Two, the gas pipeline. It is only going to increase Russia's share of Europe's gas market, I believe, and reduce Europe's energy security.

You served as Special Assistant to President Obama and Senior Director of Energy and Climate Change at the National Security Council. Do you believe the Obama Administration is actually doing enough to discourage Germany from going forward with this Nord Stream Two gas pipeline?

Mr. BORDOFF. I don't—it's been a long time since I've had a clear sense of exactly what steps the Administration is taking, so I don't have a strong view on that.

Obviously, I know the Administration's position is a lot of the similar concerns that you have over the Nord Stream Two pipeline. And a lot of steps, a lot of positive steps, I think, have been taken by the U.S. Government, by the Obama Administration, by the Energy Department and the State Department to help encourage Europe and work with European countries to increase diversity of flow and optionality of gas supply.

So I think what makes Europe more secure in the face of heavy dependence on Russian gas is not to get off Russian gas. That's probably not economically viable and it's a fairly low cost source of gas.

What makes them more secure is when they have increased pipeline interconnections, increased reverse flow capabilities. So that reduces the leverage that Russia might have to try to threaten to turn off the taps of gas supply because you can look elsewhere. You can bring in supply from LNG or from other sources.

I think a lot of progress has been made in working with countries, and this is a big part of the European Union's Energy Union Package proposal to try to work with countries to make the European market more connected.

Senator BARRASSO. Well I was just curious. It just seems to me that top ranking officials within the Administration are not really publicly speaking out against Nord Stream Two. Do you agree with that? We just have not heard much from the Administration on it.

Mr. BORDOFF. I feel like I can't—I feel like I have heard about it. I can't go back and say—

Senator BARRASSO. That is fine.

Mr. BORDOFF. Particular things here. But I do think the Administration has expressed concerns about what Nord Stream Two might do to European energy security.

Senator BARRASSO. Thank you.

Senator Gardner?

Senator GARDNER. Thank you, Mr. Chairman. Thank you for the opportunity for questions. Thanks to the panelists for your time and testimony today.

Mr. Bordoff, in your opening statement you talked about geopolitical risk and political dynamics. There are those who wish to ban hydraulic fracturing in Colorado and at the Federal level as well. But we have seen, as you have just had an exchange about, in terms of natural gas we have seen an increase in natural gas as a foreign policy tool thanks to the development of energy through hydraulic fracturing.

Should this hydraulic fracturing ban effort take hold, do you believe that that presents a political dynamic, a geopolitical risk, to foreign policy as well as energy stability in this country?

Mr. BORDOFF. So, as I said in response to the questions from Senator Franken, I think that, obviously, you need states and localities to feel comfortable moving forward with this form of energy production. And when they do you need the right form of regulation in place to make sure that natural gas, however it's produced, whether shale or otherwise, is produced safely and responsibly.

And then if that moves forward that increased domestic energy production and supply into the global market, I think as I wrote in Foreign Affairs, can have significant geopolitical benefits because the U.S. is indexed to Henry Hub prices. We have total destination flexibility and diversity of supply and our gas.

Senator GARDNER. I understand what you are saying but I think there are some who, regardless of the regulatory system put in place, structure put in place, would ban hydraulic fracturing. They have said as much on national television, regardless of the regulatory environment.

So do you believe that a ban, for instance, if you were to ban hydraulic fracturing on public lands and other areas of this country, do you believe that that would create a political dynamic that would put at risk our ability to use energy as a foreign policy tool?

Mr. BORDOFF. I think that there, as I said, there are a lot of benefits to increasing domestic energy production. One of those is geopolitical. So that would be reduced if we had less domestic energy production.

And in terms of the risks and the tradeoffs that people make between the risks and benefits, you know, that's for Federal, State and local regulators to decide.

Senator GARDNER. But how would a ban on hydraulic fracturing affect domestic oil and gas production?

Mr. BORDOFF. Well, I mean, we've seen an increase of U.S. oil production from 5.0 to 9.7, at its peak, million barrels per day. And that—

Senator GARDNER. So it would decrease. It would decrease domestic oil and gas production, correct?

Mr. BORDOFF. Yes.

Senator GARDNER. And it would decrease our ability to use that as a foreign policy tool, correct?

Mr. BORDOFF. It would—

Senator GARDNER. Like you just said, I believe you just said that through your answer. And if I misunderstood you, please correct it.

Mr. BORDOFF. Well I think the question is whether we use it as a foreign policy tool in the way some other major oil producing countries do or whether we allow markets to decide where to invest and where to have oil and gas flow into the global market because now we have allowed oil exports because the Department of Energy is allowing LNG exports. And then those have impacts in the world.

Senator GARDNER. But if you do not have enough to export that would affect our ability to use it as a foreign policy tool, correct?

Mr. BORDOFF. If we, as a government, were to decide we wanted to use it as a foreign policy tool, I think it's having geopolitical impacts that are important.

Senator GARDNER. Right. So a decline in production would affect that ability. I think that is true.

What would a ban on hydraulic fracturing do to a price of oil or gas?

Mr. BORDOFF. You would see prices go up because you'd have reduced supply.

Senator GARDNER. Ms. Minter, if you could respond to the same set of questions, what would happen to affect domestic oil and gas

production if these ideas were to be implemented to ban hydraulic fracturing? What would it do to price or to the balance of trade and our ability to use it as a foreign policy tool?

Ms. MINTER. Thank you.

Clearly much of the boom that we've seen in energy production has been driven by increased technology, driven primarily by fracturing. So one would assume that should we deny producers the ability to frack that our production costs would go up rather dramatically and ultimately we'll, we will, no longer enjoy the ability to be a low cost provider into the global markets.

Senator GARDNER. And it would have, certainly, negative economic impact on communities around the country, correct?

Ms. MINTER. As far as energy production? Absolutely.

Senator GARDNER. And the amount of jobs that would be lost would certainly be significant. Is that correct?

Ms. MINTER. I cannot quantify that but one would assume there would be an impact to producer behavior.

Senator GARDNER. One of the challenges we have, I think, in Colorado, of course, is Rocky Mountain-produced gas. Colorado can be a little bit of—the Rocky Mountain gas can be a little bit isolated, some people would believe it is isolated due to market access.

And so, a question for Ms. Palti-Guzman. The Rocky Mountain oil and gas production may be seen as a disadvantage to geography to infrastructure and ports. It is why the Jordan Cove LNG export facility is so critically important to Coos Bay, Oregon and would be such a beneficial project to producers in the Western Slope of Colorado, Wyoming and beyond. So further Federal land restrictions on the Western Slope, like some who wish to ban hydraulic fracturing, present a significant challenge to our producers.

In today's price environment, higher fees, royalties on our Federal lands, I do not believe those are the answers, higher royalties on our Federal lands. How should the Federal Government be proceeding during this low price environment besides lowering higher fees and royalties on our producers and besides approaching things like hydraulic fracturing bans to encourage producers to have more ability to develop their resources on public lands?

Ms. PALTIGUZMAN. To your previous question on what would be the impact of the ban on hydro fracking I think first of all it would be a psychological impact for buyers all around the world that the U.S. is not open for business and that there would be potentially less for exports.

And that could fit into our earlier discussion on Nord Stream Two, for instance, what Russia is doing in Europe is creating frack underground. So they are ready to build an expansion of the pipeline even without new long-term contracts. So without even knowing if demand will be there, necessarily. But the infrastructure will be there in place.

Same for U.S. LNG exports and the Jordan Cove potentially. There is uncertainty about long-term projections on demand that investments are being decided now for the future.

I think same for Alaska and the western coast of the U.S. for new LNG and price structure. You know, there is so much competition globally between different LNG projects that delay, some delay

in Western Canada or some delay in Mozambique could be a boon for Alaska or the western coast of the U.S.

So you need to look at the global LNG market evolves how this project can remain competitive. And I think how this LNG would be priced is one of the most important questions because there is a lot of discussion now with buyers, between buyers and suppliers of what will be the right price for LNG and what will be the right indexation. So U.S. LNG from the Gulf Coast is Henry Hub index. Most of the LNG in Asia is still oil indexed.

But there is a lot of push to create a hub in Asia. And in Europe there are already some hub index gas prices. So in the future the pricing of LNG will be much more diverse with different source of indexation. And if a project like in Jordan Cove or in Alaska are offering a more innovative pricing, that could be an attractive component for buyers.

Senator GARDNER. Thank you.

Thank you, Madam Chair.

The CHAIRMAN [presiding]. Thank you, Senator Gardner.

The whole discussion of geopolitics and how this all knits together is, of course, very, very interesting for us here in this country because we have gone from a nation where we thought we were going to hit peak oil. We thought we were building LNG import terminals rather than trying to figure out ways to export. All of a sudden, we are in the game when it comes to the geopolitics of our resources.

I was reminded of an article I read a few months back. It was about a community in Lithuania, I believe, that celebrated the arrival of an LNG tanker into the community with a parade and fireworks. The final line in that article from one of the community leaders was LNG means freedom to them. Pretty simple, summing it up.

Rather than take my five minutes, I am going to turn to Senator Warren because she has not had an opportunity to question. Go ahead, please.

Senator WARREN. Thank you very much, Madam Chair.

Mr. Cass, you said in your written testimony that, and I am quoting here, "Congress should not design energy development policy independent of—Congress should design energy development policy independent of prevailing market prices."

This was all through your work and, I think, in your testimony just now. You argue that oil prices are fundamentally unpredictable and that we should not make long-term policy decisions based on short-term fluctuations, so it makes a lot of sense to me. I just want to understand what that means in practice.

The Obama Administration last month released a proposed plan for oil and gas leasing through 2022. As I understand it, your position is that the current price of oil and gas should not play a role in the Administration's plan. Is that correct?

Mr. CASS. Yeah.

Senator WARREN. Good.

The Obama Administration recently finalized a well safety rule for offshore drilling. I am guessing you and I might disagree on whether that is a good idea, but if I understand you correctly we

should not decide whether to enforce this new offshore development rule based on whether energy prices are high or low. Is that fair?

Mr. CASS. I think we probably agree we need offshore well safety regulation, but I would also say that enforcing it should not be based on the market price.

Senator WARREN. Okay, “shouldn’t” be based on the market price of oil.

Now next year we are scheduled to reevaluate fuel economy standards for cars from the years 2022 through 2025. So just one more time, even if you do not like these standards, we should not change our policy based on the current price of oil. Is that right?

Mr. CASS. I would put efficiency standards in a completely different category from production decisions and so we could——

Senator WARREN. Why is that?

Mr. CASS. Well, the decisions that we make about production-related policy have implication for investments that are going to play out decades into the future.

When we talk about efficiency policy I think, unfortunately, the problem with a lot of the efficiency policy analysis that we do is it only makes economic sense if we believe that government is better positioned than consumers to, for instance, decide what kind of car they should drive.

Senator WARREN. Hold on just a sec here.

I am not debating with you whether or not we believe in more efficiency standards, right, what the CAFE standards should be, who you think is the best decision maker of the role of the government here. I am just asking that single question. Whether or not the current price of oil should affect long-term planning like the efficiency standards? And you have told me in other areas, no, the current fluctuations in price should not matter, I just want to know why you think they should matter then on CAFE standards?

Mr. CASS. I think you might be misunderstanding me. I think that efficiency standards also should be set independent of short-term prices, but I also think that that means that the cost benefit analyses conducted to justify those efficiency standards need to recognize that the prevailing price, at some point in time, may not be the long-term price.

Senator WARREN. Well, fair enough then.

So, I just want to make sure then, it sounds like we are coming to the same place. And that is right now, as we are trying to decide what the appropriate standards are for 2022 through 2025, the current price of oil just simply should not bear on that.

Mr. CASS. I think that’s correct.

Senator WARREN. Good.

Mr. CASS. But I would also say that EPA’s cost benefit analysis, assuming a \$4 per gallon price of gasoline in setting those efficiency standards was probably not well researched.

Senator WARREN. Well, but the question is should we make a change now because we have seen a change in oil prices. I think what you are saying, you said pretty consistently, I will quote you, “The same policies that make sense in a low price environment, make sense in a high price environment.”

You know, I think the relevance of this is that the auto industry agreed to these fuel economy standards back in 2012 and now they

are arguing that we should weaken these standards because oil prices are low. I am glad to know that even conservative policy experts might not like the fuel economy standards or the process by which they're done, but that low oil prices today are not sufficient reason to change them.

So let me ask Mr. Bordoff another question. Do you think that today's low energy prices are a good reason to roll back the policies that protect the environment and consumers?

Mr. BORDOFF. I do not, as I said in my testimony. I think government's role is to protect air and water, to correct market failures like pollution, to look at permit decisions on energy infrastructure and do that smartly, cost effectively, weigh cost and benefits, but do that largely independently of short-term fluctuations in the energy price.

I would say regulations do/can impose, potentially, a cost on consumers and on the industry, but the lack of regulation can as well. From Flint to the Aliso Canyon in California we can see the cost to the communities and to the environment when something goes wrong.

Senator WARREN. Well, thank you very much.

You know, we hear over and over how low energy prices mean that we need to go easy on oil and gas companies and that auto makers, despite their track record of success, cannot possibly be expected to meet fuel economy goals. But if we really want policies that are going to work for the long-term, policies that protect consumers and protect the environment, policies that encourage innovation and that create predictability, we cannot reverse course every time prices shift.

I think that means upholding tough, achievable fuel economy standards and it also means not backing down just because the industry does not like it.

Thank you, Madam Chair.

The CHAIRMAN. Thank you.

This is probably directed to you, Mr. Cass and Mr. Bordoff. This is regarding the position that some of my colleagues have suggested that this country needs to embark on and that is a policy that has been dubbed the keep it in the ground movement. That basically these resources that we are talking about here this morning, oil and gas, should be best kept in the ground, apparently, for some future point in time or from an environmental perspective.

I am assuming that I know what your answer is and Senator Gardner alluded to it when he was speaking about a ban on fracking, but this is broader than just a ban on fracking. Do you think that this is wise Federal policy to basically prohibit production of fossil fuels on our Federal lands? What do you think of the policy or the proposed policy?

Mr. CASS. No, I don't think it's sensible for two reasons. One is that, even if one's primary focus is combating climate change, the keep it in the ground policy will do almost nothing to address that goal. And the second problem is that we continue to, for instance, sell millions of cars onto our roads in America and build all of the infrastructure that's going to require the consumption of oil and natural gas. So the only question is whether we're going to produce that energy ourselves or import it. And as long as our economy is

going to consume that energy, we're certainly best served to be producing it here as well.

The CHAIRMAN. Mr. Bordoff, if you can speak to that, but also speak to the energy security and the national security implications. I think Senator Cassidy also alluded to the jobs perspective. But when we talk about a policy that would take us in a direction that says we are just going to keep these valuable resources in the ground. Your comments and thoughts, Mr. Bordoff?

Mr. BORDOFF. Yep. Thank you for the question, Chairman Murkowski.

I think that on the supply side what is important, as I said earlier, is having the right government regulations to make sure that oil production, gas production, hydrocarbon production is done safely and responsibly, protects air and water resources.

I think what we need to do is we need to take—put in place policies that address problems like climate change that internalize social costs. And over time that will reduce demand, potentially, for hydrocarbon resources and that will have an effect over the long term of reducing the supply that is produced.

I think that is the more effective way of achieving the goals of reducing carbon emissions by focusing on policies that reduce demand. And if all one did were to ban domestic production in a certain place, demand would still be there and it's going to be produced somewhere in the world.

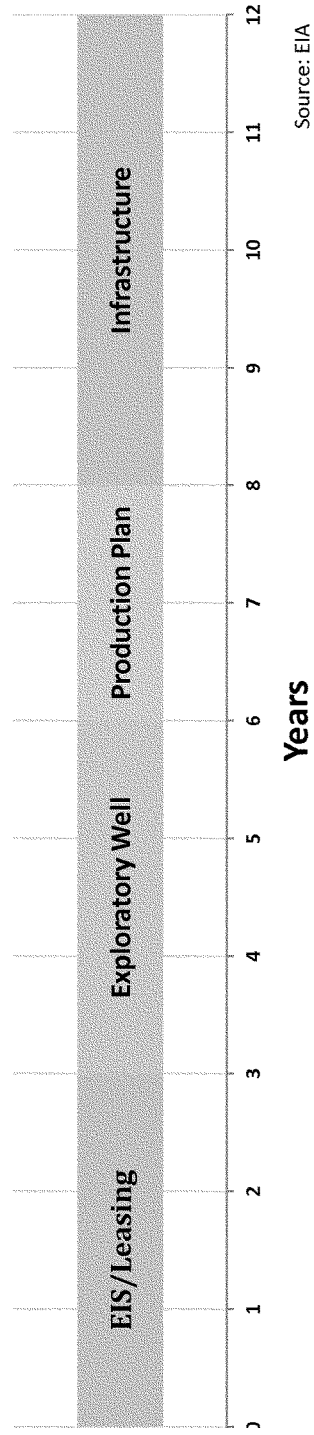
And secondly, as you said, there are economic and geopolitical benefits that need to be considered that would be lost and that need to be considered and weighed against, you know, potential environmental risks and make sure that we manage those with the right regulations.

The CHAIRMAN. Thank you.

Mr. Ratner, I mentioned in my opening comments and it has been suggested here that the lag time between the decision to move on a lease, whether it is oil, natural gas and actual production, is oftentimes a decade plus, and my example was ANWR. We have a chart that shows that year zero when legislation could be enacted, producing oil still requires eight to 12 years of work.

[The information referred to follows:]

ANWR Development Timeline



You have an EIS that would take two to three years. Drilling a single exploration well, another two to three years. BLM approving a production plan, one to two years. Then constructing the pipelines, the fabrication, the treatment plants, drilling pads, well complications, you know, another three to four years. This all assumes that there are no legal challenges and that the exploration is successful and on and on and on.

The question to you is whether it stands to reason that the oil that we are consuming today, that we are seeing here in this country, was made possible by regulations and commercial decisions that were made eight, ten, 15 years prior to that time. Is that a rational, reasonable assumption to make?

Mr. RATNER. Yes, I believe that's correct.

I mean the industry, as you know, plans out when they're looking forward to how they evaluate the market as things have been said, going out to five, ten, 15 years based on the existing regulations at the time and where they think the regulations may be going as well.

The CHAIRMAN. When we are thinking about the direction that we take, recognizing the importance of some certainty and stability and transparency, when it comes to our regulatory process, not only for today, but for what it means for future development, I think is key.

Senator Cassidy?

Senator CASSIDY. Ms. Palti-Guzman, you mentioned in your testimony that one of the contingencies as to whether or not there would be a market for our liquefied natural gas is whether there is a price on carbon.

Europe does have a price on carbon, correct? I mean, a significant price on carbon. Obviously BTU per carbon is much more favorable for natural gas than coal. So I just pose that question because it seems as if you were putting that as a variable, but it does not seem a variable at all because it seems already in place.

Ms. PALTI-GUZMAN. I think the current price on carbon is maybe not the right one, and what we've seen in most European countries is that natural gas has not been competitive with coal over the past.

Senator CASSIDY. Excuse me?

So even if that price has fallen as it appears to be, and it does seem a matter of time before it is disassociated from the price of oil, if nothing else, there is Azerbaijani, there are the Israelis. There are all these other pipelines bringing gas.

So I am asking, I do not know this at all. Do you imagine that that price will come up with a hub, as you referred to, and at that point will become competitive with the price of coal?

Ms. PALTI-GUZMAN. So what we're seeing right now in Europe is a price war. And we see the established producers, Russia and Norway, bringing the prices down at record bottom prices, around \$4 per million BTU to price out other competitors, notably LNG suppliers.

So the price of natural gas right now in Europe is really low, and it could potentially be triggering more coal to gas switching in power generation. And last year, in 2015, for the first time we saw a little recovery in natural gas demand in Europe. That was, you

know, I think it was since, for the past four or five years we saw a decline in natural gas demand in Europe.

So there is no obviousness of the role of gas in Europe if gas doesn't remain competitive, and there is really a fight for market shares between all the different suppliers because——

Senator CASSIDY. Now I get that, but just in the interest of time, as we drive that price down there could be, if you will, more of an uptake in use. I say that because, obviously, it would be for those concerned about carbon emissions, it would be a way to fuel your economy, literally, with significantly less carbon emissions.

Ms. Minter, I read a very interesting book, *The Accidental Superpower*, and it suggested that fracking is really not something that will go worldwide because it takes a certain geologic formation. It takes certain capital markets. It takes a certain risk and willingness to tolerate risk that the U.S. is fairly kind of unique in. Would you agree with that?

Ms. MINTER. Absolutely, thank you.

It is really important, when we think about what's happened here in North America as far as the American energy story, to realize that this is the only place on the globe where we have this unique set of investment, of land ownership——

Senator CASSIDY. So let me ask then. What about the Chinese, who do not have our same sort of property rights, but that in itself, they can basically say you have now volunteered your land, I gather? Would they be able to reproduce because that has been mentioned as a possibility?

Mr. MINTER. It's clearly a function of geology.

It is believed that the U.S. only holds 30 percent of the global shale reserves. That being said, we also have 60 to 100 years of infrastructure in the ground that allowed us to bring this production to bear on the market so quickly.

So given the fact that private equity has been willing to invest in the U.S. and U.S. infrastructure, it allowed us to develop this rather rapidly. It will take a while for other countries to be able to bring this type of production story into the global——

Senator CASSIDY. Even countries which are somewhat authoritarian and can override local considerations?

Ms. MINTER. I think the lack of infrastructure is really going to be their whole——

Senator CASSIDY. So green field is more difficult?

Ms. MINTER. Yes, absolutely.

Senator CASSIDY. Good.

Mr. Cass, I am really struck, man. Typically, around here if you say states are going to take over permitting on anything, whether it is driver's licenses on up, people say oh, we cannot do that. You are saying why don't we turn over permitting on Federal lands to the states involved? Could you please elaborate on that? Again, fear mongers will say, we cannot trust the states, whatever our founding fathers said about federalism we must absorb that power. Will you comment?

Mr. CASS. Sure.

You know, the reality is that states already operate fairly comprehensive regulatory and permitting regimes because of all the work they do on private lands and state held lands. And so, with

respect to the fracking related boom, in particular, almost all of that development has occurred outside of Federal control, probably not entirely by coincidence. And as a result it's really the states that are the centers of expertise in a lot of this type of activity, and frankly have demonstrated they can do it far more quickly than Washington can and every bit as effectively.

Senator CASSIDY. So if there is a learning curve, the states have done better with the learning curve, only because they have been in the curve, as opposed to the Federal Government which has excused itself, for whatever reason, and therefore would not have that expertise.

Mr. CASS. That's definitely true there further down the curve. And I also think that the political dynamics tend to be different. You know, there are going to be places, like New York State, where allowing the state to control things might lead to really bizarre—

Senator CASSIDY. Stagnation.

Mr. CASS. And counterproductive policies.

But the flip side is that states that are focused on economic development and value their energy resources, are going to be a lot more focused on developing them well and frankly care a lot more about their local environment than you would expect from a Washington bureaucracy.

Senator CASSIDY. I accept that totally. I am sure others would not, but it makes total sense to me.

Do you mind if I ask one more question, Senator Heinrich?

Senator HEINRICH [presiding]. Sure, go right ahead.

Senator CASSIDY. Also the new source requirement that they expanded, can you elaborate on that?

Mr. CASS. Yeah, you know, I think it's important to understand that under the regulatory environment, controlled by the EPA with the Clean Air Act, the Clean Water Act, we have two very different sets of environmental rules. One for facilities that already exist, and a much tighter one for new facilities that want to be built or expanded.

And especially at a time like this when we're seeing such a revolution in our energy market, different sources, different price points. It's really unfortunate that you're telling somebody, an existing coal plant, for instance, gets to play by different rules than a new natural gas plant would or new pipelines have to face tighter restrictions than existing ones would.

And so I think, as Mr. Bordoff has emphasized, we certainly don't want to ban an environmental regulation in this context. Environmental regulation is every bit as important as it ever was. But looking at the regulations that already control the infrastructure that's out there, we should really be happy to keep building under those rules rather than tell anybody new that they need to hit a higher standard.

Senator CASSIDY. I will bring this back to both something Senator Murkowski said and Ms. Palti-Guzman mentioned, the degree to which we continue to bruise natural gas at a low cost is the degree to which coal will be replaced worldwide with natural gas, if only because that initiates the price war, is the degree to which there is less carbon emissions. So if you cutoff the carbon here you are penny wise and a pound foolish if carbon is your concern.

Mr. CASS. That's exactly right.

And I think it's important to understand that the United States has been a leader in seeing reductions in its carbon dioxide emissions over the past decade. That's almost entirely the result of our increased use of natural gas. Natural gas has reduced our emissions about 13 times faster than solar power has.

Senator CASSIDY. Yes.

I have really enjoyed the panel. Thank you all for your expertise. I yield back.

Senator HEINRICH. Thank you, Senator Cassidy.

Mr. Bordoff, I want to actually look a little bit at that assumption which is that because the carbon dioxide emissions from natural gas are approximately 50 percent over those of coal, that the net impact for climate is twice as effective is a 50 percent reduction. Now assumed in that is that you actually capture that natural gas and that you are not putting methane, which is a very powerful driver, directly into the atmosphere unburned. What role do you think, if that assumption is to be correct, what does that mean for our policies with regard to making sure that we do not waste methane?

Mr. BORDOFF. As I said earlier, that I think it means some really good research and studies have been done showing that at fairly low cost for just cents on the dollar, you can put smart policies in place that require people, gradually over time, building the necessary infrastructure to capture methane and make sure that it's not leaked or vented. And if we do that and I think it's a solvable problem. I mean I think natural gas——

Senator HEINRICH. Right.

Mr. BORDOFF. Has had enormous geopolitical and economic benefits, as we talked about, the shale boom.

Senator HEINRICH. We have talked a lot about the economics of that.

Mr. BORDOFF. Yeah.

Senator HEINRICH. But also within the climate piece of that.

Mr. BORDOFF. Right.

Senator HEINRICH. All assumptions for those improvements only hold if we actually use the methane for the purposes that use the natural gas, burn it and then release carbon dioxide as opposed to unburned methane into the atmosphere. Is that correct?

Mr. BORDOFF. Yeah. So I mean, I think the way I would put it is I think cheap gas helps lower the cost of implementing climate policy. It has been one of the key drivers that has led to a substitution away from coal and help drive a reduction over the last decade in U.S. carbon emissions. Cheap gas alone does not solve the climate problem.

Senator HEINRICH. Sure.

Mr. BORDOFF. Or get to the kinds of reductions that we need.

I'd also underline, as Senator Franken said, renewables or nuclear. But with climate policy, strong climate policy in place, that's done well, that's cost effective, having lower priced rather than higher priced natural gas can help achieve the carbon reduction targets we have at a lower overall cost to the economy.

Senator HEINRICH. Well said.

These policies also can provide additional savings for consumers if they are well crafted. If you look back at the CAFE standards that were put in place in 2007, they are estimated to save consumers \$140 billion by 2030, a very substantive amount.

Do you have thoughts for the impact of low prices on policies like that and whether or not we will continue to have the right incentives to utilize these resources conservatively and efficiently in the face of low prices and how you deal with that swing in commodity prices because it sends different market signals at different times?

Mr. BORDOFF. Well consumers definitely respond to prices. I think in 2014 oil demand rose 800,000 barrels a day. Last year it was 1.8 million barrels a day. So the people are using more. U.S. vehicle miles traveled last year, I think, was up almost four percent, the highest increase in almost 30 years.

If you look at the payback period of a Ford Fusion hybrid versus gasoline, and you assume \$2 versus \$4 that payback period is going to be 8.6 years rather than 4.3 years. So you know, that matters to consumers, who are cash constrained, who value, as most of us do, a dollar today more than a dollar in the future.

So, it undermines the—and we've seen that in the sales of SUVs and the hybrid and electric vehicles in the U.S. today. We've seen increase in SUVs, reduction in hybrids. So, consumers are responding to that.

I think that is why it's more important, not less important, that we move forward with smart policies that over time help to reduce oil use. Not only because I think that's important for environmental and carbon reasons, but also because I think ultimately when we think about U.S. energy security oil prices are going to go up and down.

They're going to spike and then they're going to fall. That leads to the kind of volatility that, I think, can harm the economy. And so I think we're more secure when our economy is less, when the oil intensity of it goes down.

Senator HEINRICH. Thank you very much.

I was going to say running counter to that trend is the electric car driving the Senator to my right, Senator King.

Senator KING. Mr. Bordoff, you talked about the rise and falls in prices of oil, historically until the last four/five years oil and natural gas prices moved in box step. That seems to have broken.

Do you think that that dis-relationship between those two commodities is permanent or is that a temporary phenomenon?

Mr. BORDOFF. I think it's going to continue to break in many respects. I mean the trends we're seeing, and Ms. Palti-Guzman talked about this earlier, is where, in places around the world where the price of natural gas has historically been linked to the price of oil, that relationship is being broken. We're seeing increased price for natural gas being set based on supply and demand for that commodity and based on gas to gas competition.

You've seen an increase in the European market in spot gas sales and in gas sales based on gas to gas competition. It's going to take some time for that to happen in the Asian market, but we're seeing this really historic transformation, I think, in the global gas market driven in part by the fact that we have a surge of liquidity in the market from increased trade in LNG. And the U.S. along with

Australia is the primary driver of that for the next five or ten years at least.

That is going to, that sort of liquidity in the global gas market, diversity of supply, increased competition of the kind of conditions that you need to allow price discovery and to allow a price for gas that reflects supply and demand for that commodity rather than supply and demand for another commodity.

Senator KING. One of the differences is that oil is a worldwide commodity. Gas is not, at least at this point.

I am from a region of the country that is becoming very dependent on natural gas. We used to be the most oil dependent region in New England. Now we are one of the most. Fifty-five to sixty percent of our electricity comes from natural gas. A lot of people's homes are now heated with natural gas.

My concern, to put a fine point on it, is unlimited LNG exports and their effect on domestic prices. We have had a lot of discussion here. I would like your view on that, on is there a point, I mean, we have been given very warm reassurances. Don't worry. Don't worry, it is going to be fine. The prices are not going to change.

Yet, the experience in Australia was not that, as you know. At what point should we start to be concerned, because the low price of natural gas in the U.S. is a significant competitive advantage not to mention an advantage to consumers everywhere, the competitive advantage of manufacturing. Is there a point at which LNG exports can significantly affect domestic natural gas prices?

Mr. BORDOFF. Yeah, no, it's a really good question. And I would say I think, first of all an increased use of natural gas, increased global gas trade, the emergence of gas as a fuel, not just in the U.S. but globally, has several potential benefits, economic, geopolitical—

Senator KING. Big environmental benefits.

Mr. BORDOFF. But it also may present new risks.

I think if you look at the new—I was just, within a week or two ago, with the International Energy Agency in Paris. And one of the three mandates, the charges, that the new Executive Director, Fatih Birol, has from the members of the IEA, is security of gas supply because the world of gas is changing in really significant ways. And that, again, presents a lot of potential benefits, but potentially raises new risks.

I think we need to think about what those are and what sorts of steps/policy measures might be taken to make communities that will be increasingly reliant on natural gas, secure in the event of unforeseen sorts of—

Senator KING. So far you have not answered my question. Do you think—

Mr. BORDOFF. So as—

Senator KING. LNG exports will affect domestic price?

Mr. BORDOFF. So as regards the export of natural gas, anything that increases demand for natural gas and an export market will on the margin slightly push up the price of natural gas. The Department of Energy has estimated that. It's a pretty small impact.

I think the supply curve we think exists for shale gas is pretty flat. We've got a lot of gas in the \$2, \$3, \$4 range, and so I think

there are a lot of factors that may affect gas prices domestically. The potential for LNG is just one of them.

And I wouldn't say that that concern would support banning trade in natural gas. And actually if U.S. gas prices were to rise too much, then the arbitrage window would close and the global market wouldn't be there for U.S. LNG anymore. So it just wouldn't make economic sense to do it.

Senator KING. But the difference is pretty big right now.

Mr. BORDOFF. Well, it's—

Senator KING. Between \$2 or \$3.

Mr. BORDOFF. Well, it's narrowed a bit.

Senator KING. It narrowed a bit.

Mr. BORDOFF. I mean, it narrowed a bit, but yeah.

Senator KING. But it is still a multiple of like two or three.

Ms. Minter, your views on the relationship between LNG exports and domestic natural gas prices?

Ms. MINTER. One of the big things to realize about the U.S. energy story is that it's very much driven by the Northeastern U.S. which is a gas play. So, you know, we drill. There are two windows of production in the Northeast. One is a conventional wet window, and one is a dry window, I'm sorry, a wet window and one is a dry window. And the U.S. is the only place in the globe, really, that we drill in that wet window to create liquids. And with that comes associated natural gas.

Unfortunately, and it's almost ironic, in our five-year outlook for production in order to grow the way we would like to grow natural gas, we are looking for exports to make up almost 50 percent of our demand. So without that demand outlook we will not be allowed to grow natural gas as much as we would like to which would basically benefit all of us as consumers of low cost natural gas and also the producing environment.

Senator KING. Okay. You did not answer my question either. You talked about a 50 percent increase in exports. Will that affect domestic natural gas prices?

Ms. MINTER. It will. It will. However, it will, in our price forecast we come to about \$4.50 in 2020. That being said, the current low price environment for natural gas that we're in is not adequate to sustain the production growth that we're currently experiencing.

Regardless of LNG exports—

Senator KING. So \$4.50 is about a doubling of current prices.

Ms. MINTER. It's also about 60 percent lower than where we have been historically. The reality is the current price environment will not allow us to continue this sort of production growth.

March of this year—

Senator KING. I understand that \$2.50 is unsustainable from a production point of view on the long run. My concern is going, heading more toward \$10 or \$12 which is the price in Asia.

Ms. MINTER. We do not see that happening. We feel that there is adequate production response that will be profitable in that \$3 to \$4 range that will invite producers to come back in and keep producing.

The technology story has really changed the outlook for pricing. Producers are showing us that they will bring on production at volumes, at prices, much lower than anybody ever expected.

Senator KING. Good.

Thank you, Madam Chairman.

The CHAIRMAN [presiding]. Thank you, Senator King.

Mr. Bordoff, let me ask you a question because you have been before this Committee when we had a hearing on our Strategic Petroleum Reserve (SPR). There has been a little bit of discussion here about cushion and some availability of supply that allows us to have some degree of control here.

We have not really talked about the Strategic Petroleum Reserve. I, as you know, have long been one of those proponents that says, look, this is a reserve, and it is important that we preserve this reserve. If we were to see any kind of a prolonged disruption, how important is it that we continue a decent level of domestic oil production just from a national security perspective, an energy perspective?

As you know, we have moved forward with some sale from the SPR, some drawdowns. Unfortunately I think we have people that have looked at the Strategic Petroleum Reserve as an avenue or an opportunity for access to cash. I call it a cash machine which is not what it was intended to be.

Can you just speak a little bit to the significance of the Strategic Petroleum Reserve and why it is important that we keep up a level of domestic production?

Mr. BORDOFF. Yeah, thank you for the question, Chairman Murkowski.

And so I think at the time I talked about the ways in which the global oil market has changed over the last 40 years and the extent to which long term contracts and supply on particular destinations had given way to a very liquid, very fungible global market, potentially creating new risks.

So whether we're a large producer or not, whether we're a large importer or not, if there's a supply outage somewhere in the world, if something were to happen in the Strait of Hormuz or somewhere else, prices would go up globally for everyone.

The Strategic Petroleum Reserve can play an important role in mitigating that. But it is a global market. So I mean, when you sort of think about the limitations of any stockpile that we would have, but I think the SPR has been a really important national security resource for 40 years. I think it is appropriate.

And I think the Department of Energy is doing this, sort of taking a careful look at how the market has changed and does that make, should we as a result of that, think about changing SPR policy whether it's the mix of crude verses refined products, whether we should be using it more often or less often, whether we should be increasing or decreasing the size, I wouldn't do that just to raise revenue.

In terms of increasing domestic supply, the impact of that in the global, I mean, more supply in the global market on the margin helps with supply with supply security, helps lower price of U.S. shale boom of almost five million barrels a day of supply over the last six years or so I think has been a, or the primary driver of the oil price decline that we're seeing now.

As I talked about earlier, I think the macroeconomic vulnerability we have to price shocks is lower when we're less of a net

importer. So there are benefits both economic and geopolitical to increasing domestic supply.

The CHAIRMAN. My last question is going to be hopefully a bit of a lightning round here.

What I have heard from each of you is that look, oil prices go up, they go down. I have not heard any one of you suggest that oil prices are not going to rise at some point in time. It is just a question of when and how much.

So the question to you is how do we prepare for that next increase and do we start preparing now? Can you give me a couple steps as to what we need to do to prepare for higher oil prices? If I have misread your comments and you do not think that we are going to see higher oil prices, you can tell me that too. But recognizing that it is more likely than not that it will come, how do we best prepare for that?

We will start with you, Mr. Bordoff, and go straight down the line. I do not want a long answer, but maybe there are no short answers.

Senator KING. Can I answer? [Laughter.]

The CHAIRMAN. Yes, you can answer too. You are after Mr. Ratner.

Mr. BORDOFF. I think it is true we're going to see boom and bust cycles. We've seen them before when, I think after Edwin Drake discovered oil in 1859, the price went from \$16 to \$0.50 back to \$8 during the Civil War.

So prices move around a lot, and they're going to again. And that's why I think we need to make sure we have really good policies in place, good environmental protections, all the rest, to make sure we have strong domestic supply. But also, as I said before, reducing the oil intensity of our economy reducing our vulnerability to those sharp swings in price.

So things we can do that have economic, national security and environmental benefits that over time reduce how dependent our economy is on oil, I think that is what will make us more energy secure.

The CHAIRMAN. Okay, so good policies and reduce our reliance. Mr. Cass?

Mr. CASS. Well I should say I have no idea whether oil prices will go up significantly again or not. It seems like they might. Forty dollars might be the highest they ever go.

I think the important thing is that the government play the role of maintaining a market and let private investors place their bets where they will. And so I think maintaining a good market for future investment means asking the question what kind of production do we want to be capable of in 2025 or 2030?

What we've learned from the shale boom is essentially the more the better that to the extent that private companies would like to invest in developing additional resources, the better off America will be. And so that means creating as much certainty as possible in the market to encourage the investment and then providing access to the resources with all of the regulatory controls that Mr. Bordoff described, but providing access and providing certainty that if people want to make the investments they can pursue the production.

The CHAIRMAN. So the certainty there.

It is an interesting suggestion though that we need to determine what level of production we actually want a decade or so from now. Of course, we do not know where our technologies will take us, but okay, I appreciate that.

Ms. Minter?

Ms. MINTER. Thank you.

This will, sort of, feed off of Mr. Cass' comments.

Really what's wrong with the pricing scenario right now is we clearly just have too much energy, right? Supply and demand and infrastructure all need to align themselves in order for the market to work. And when we're oversupplied on one end of the equation without adequate demand, prices respond.

I do agree with you that prices come up over time, and that will be a result of the fact that demand growth has matched, has, demand growth has kicked in. So allowing for supply and demand to drive the market and also allowing for policy to continue, that we continue to build out adequate infrastructure to allow these two pieces to meet, when they occur, will allow for less volatility in the price markets going forward. They will be higher, but they will probably become less volatile and you can get your product to your market and you have a market to get it to.

The CHAIRMAN. Perhaps even accepting a little bit higher price with less volatility is not a bad thing for your economy.

Ms. Palti-Guzman, would you agree?

Ms. PALTI-GUZMAN. Yes, ma'am.

So next, when we see the next increase in oil prices potentially beyond 2017 that sub-\$100 anyway, I think, there will be a direct impact on the call for U.S. LNG as the oil index suppliers to Asia, for instance, will lose competitiveness again.

But I wouldn't take this for granted. And the U.S. needs to remain a reliable and stable supplier. And for this, maybe, alleviate some anxiety from buyers that one day some export license could be revoked or there will be a policy change.

So for that, I think, that all the trade partnerships that are being discussed now are definitely encouraging more buyers to look into U.S. LNG and even more in the future. I think there is also an institutional role from governments in the U.S. and all around the world to push for more liquidity and transparency in the global energy markets.

The CHAIRMAN. Very good. Thank you.

Mr. Ratner?

Mr. RATNER. Well as I said in my opening statement CRS doesn't recommend policy. But I will comment on a couple observations that I've seen in my career. I think shale gas and tight oil offer a good example of things that came up when nobody else was looking at those.

If you think back to the mid-2000's and early 2000's when we were building the LNG import terminals, there was, I mean, and I've looked back. There are no articles about shale gas and what it could mean. And then all of a sudden it showed up on the scene and changed the way that we do business. So I think things that encourage market efficiency both on the supply and the demand side are the most important things.

The CHAIRMAN. I appreciate that.

Senator King, what do you think?

Senator KING. Well first, I agree. I think it was Robert Gates who said we have a 100 percent record of predicting the future, we are always wrong.

The CHAIRMAN. Yes.

Senator KING. But some thoughts about this and particularly to the question of how do we keep ourselves from dependency.

One is electric cars powered by natural gas and renewables. The fact that Elon Musk sold 400,000 cars in two days, I being one of them, is a remarkable sort of watershed. Now whether they will be able to deliver those cars and how much they are actually going to cost and all of those kinds of things. But that is an enormous potential change and natural gas supplying the electricity along with renewables.

The other major development, it seems to me that could change all the calculus, is the development of storage capacity because once there is a development of grid scale storage capacity then things like wind and solar become much more feasible as baseload power sources than they are today, obviously they are not today.

The other thing that is affecting, I think, dramatically the future is the decline in price of solar panels.

But shale gas and the decline in price of solar panels, I think, are the two major energy developments of the last decade. When solar panels have gone from \$70 a watt to \$1.80, that is a huge deal. Storage is going to be an important part of that.

I really think that over the next ten years it is quite conceivable that all of our speculation about oil and oil prices could change.

I have a Nissan Leaf. The little thing, you know, on the upper left hand corner that tells you when your maintenance is. On the Nissan Leaf the little sign says at 16,000 miles, rotate tires.

[Laughter.]

That is it. There is no oil, there is no gas, there is no transmission. That is it. It is a direct drive electric motor.

I do have a question, however. When does the price of gas intersect with renewable feasibility? In other words, right now at \$2 nothing can compete with gas. When do solar and wind, what is the line? I remember in the wind business ten years ago it was about \$6 or \$7. My sense is that it is now lower than that. Does anybody have any thoughts on that?

Do you see what I am asking? In other words, right now gas is killing everything because the price is so low. Nothing can really compete. But at what point, when gas gets to \$4.50, is that the number that will make solar and wind more competitive or coal or other technologies? Any thoughts?

Ms. PALTI-GUZMAN. I don't really see them as competitors. Actually I think that natural gas is a very flexible source of supply that can be the best partner to renewables, especially as long as they're—they need another, kind of, base load power.

Senator KING. Right.

Ms. PALTI-GUZMAN. Or back up power while the——

Senator KING. I tend to agree with that as long as the fracking is done in an environmentally sound way. I think that is probably accurate.

Ms. PALTIGUZMAN. And if I may add to one of your previous questions.

I think that we definitely see a growing convergence of gas prices around the world and the U.S. will slowly, gas prices in the U.S. will slowly, marginally increase. But U.S. gas pricing will and the consumption of natural gas in the U.S. will remain very low compared to other consumers of natural gas because they are the producers while the other one needs to import. So they add the transportation costs—

Senator KING. Right.

Ms. PALTIGUZMAN. And the production costs and so on and so on. So even if we see—

Senator KING. That is about \$7, isn't it? \$6?

Ms. PALTIGUZMAN. So right now in Asia the average for long-term and spot prices, I think, is below \$8, but on the spot it's even lower. It's \$5 per million BTU. And in Europe it went very low since the beginning of 2016 and hub index gas prices now are around \$4 per million BTU.

Senator KING. But LNG could not compete in a \$4 market in Europe, could it? Doesn't it cost more than that to condense it and ship it?

Ms. PALTIGUZMAN. So if you look at only the short run of U.S. LNG that can compete and land LNG cargoes at \$4 per million BTU, but it means that the exporters have made the conscious choice of looking at liquefaction fees, for instance, as a sum cost and other variable costs that may not be recovered.

Senator KING. Okay. You know, everything works if you do not have to recover your costs.

Thank you, Madam Chairman.

The CHAIRMAN. Thank you, Senator King.

Thank you for very good discussion this morning on, clearly, an issue that is of great interest, not only to those of us in the Congress here, but the consuming public interested in knowing what happens to the prices that impact them whether it is the production of their power or how they fuel their vehicles, but also the broader perspective of the geopolitical impact that we are seeing because of the low prices.

Again, the ability to predict the future here is something that I have not been able to perfect. I think what we try to do, as best we are able, is to put in place those policies that are more balanced, if you will, more evergreen, if you will, and allowing a playing field that works for a market to flourish.

I thank you for what you have provided us today. We have yet one more vote, Senator King. We apologize for jumping up and down, but thank you again for the flexibility in your schedule.

We stand adjourned.

[Whereupon, at 12:14 p.m. the hearing was adjourned.]

APPENDIX MATERIAL SUBMITTED

**U.S. Senate Committee on Energy and Natural Resources
April 26, 2016 Hearing: Challenges and Opportunities
for Oil and Gas Development in Different Price Environments
Questions for the Record Submitted to Mr. Jason Bordoff**

Questions from Senator John Barrasso

Question 1: In a February 15, 2016 Wall Street Journal op-ed titled, “Germany and Putin’s Pipe Dream,” John Vinocur wrote: “you can’t find a top-drawer Obama administration voice fighting Nord Stream 2.” Mr. Vinocur went on to say that: “Appearing at the Munich Security Conference over the weekend, just after denunciations of the [Nord Stream 2] pact at the same podium by the chiefs of state of Ukraine and Poland, Secretary of State John Kerry left the matter out of his speech.” During the hearing, I asked you whether the Obama Administration is doing enough to discourage Germany from going forward with the Nord Stream 2 gas pipeline. I also asked you whether you agreed with me that top-ranking officials within the Obama Administration do not seem to be publicly speaking out against Nord Stream 2. You said: “I feel like I have heard about it – I can’t go back and say particular things here – but I do think the Administration has expressed concerns about what Nord Stream 2 might do to European energy security.”

To your knowledge, who is the highest ranking official within the Obama Administration to speak out publicly against Nord Stream 2? (If possible, please provide either a news report about the official’s statement or a copy of (or website link to) the statement.)

RESPONSE:

There have been many comments expressing concern about Nord Stream 2 from Secretary of State Kerry, Assistant Secretary of State Nuland, Special Envoy Amos Hochstein, and others. I have provided the relevant website links and quotes to articles I found below:

Secretary Kerry:

- “And we’re also going to discuss one other specific issue of deep concern to me and to everybody here, and I think that’s the Nord Stream 2 pipeline. This project has provoked a very heated debate on both sides of the Atlantic, and we are convinced would absolutely have an adverse impact on Ukraine, on Slovakia, and Eastern Europe. And we cannot lose sight of that.”
<http://www.state.gov/secretary/remarks/2016/05/256882.htm>

Assistant Secretary Nuland:

- “Any effort to drag Europe back into single source energy dependence undercuts our strength and our sovereignty. From Nord Stream to Turk Stream, the risks are the same.” <http://www.state.gov/p/eur/rls/rm/2015/nov/249587.htm>

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Special Envoy Hochstein:

- “Our commitment to energy security in Europe is directly linked to our concern for national security,” Amos Hochstein, U.S. special envoy and coordinator for international affairs, told journalists in a conference call.
“The U.S. is deeply concerned about a pipeline that would endanger the economic viability of Ukraine,” he said, adding it would “deepen the rift between East and West.”
<http://www.reuters.com/article/us-eu-gazprom-us-idUSKCN0XX1YG>
- “This is a project that will serve the Russian narrative completely from all aspects ... and it creates just the chasm [the Russians] want in the middle of Europe,” said Amos Hochstein, the U.S. State Department’s special envoy for international energy affairs.
“It revives the Cold War line as an economic one rather than a military-political one, with countries that have no choice but to be dependent on one side of the line with no option for diversity of their supplies,” he told POLITICO in Washington. Nord Stream 2 would damage Ukraine’s economy and put an “economic boot” on the necks of governments in Eastern Europe and Balkans, said Hochstein.
“Nobody spends money building pipelines in a low-oil environment when you already have a pipeline that works just fine. That’s not a commercial deal. That’s a political deal — and a bad one.”
<http://www.politico.eu/article/the-great-northern-gas-war-nordstream-pipeline-gazprom-putin-ukraine-russia/>
- “All I see is an overarching political agenda to get rid of Ukraine as a transit country at all cost, no matter what the financial cost is,” Amos Hochstein, the U.S. special envoy for international energy affairs, said in an interview.
“For a country that is facing a Russian aggression militarily in the east, I would be very concerned that this is an attempt to undermine the economic stability of the country in nonmilitary means,” he said. Ukraine, which had to restructure its debts earlier this year and has been depending on a bailout from the International Monetary Fund and the EU, gets around \$2 billion a year in transit fees from Gazprom.
<http://www.wsj.com/articles/nord-stream-2-pipeline-spat-to-test-eu-commitment-1450298291>

Question 2: On April 18, 2016, the Wall Street Journal ran an article titled, “EU Energy Chief Sees Significant Role for Iranian LNG in Europe: EU is seeking to expand commercial and political ties with Tehran following nuclear deal.” The article discusses the recent visit by the European Union’s Energy Commissioner, Miguel Arias Cañete, to Iran. Mr. Cañete believes that Iran will be able to start exporting liquefied natural gas

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(LNG) to Europe within three or four years. The article explains that: “Iranian authorities are looking to complete three LNG plants that were in the works before sanctions were tightened early in the decade.” The article quotes Mr. Cañete as saying that Iranian LNG: “fits with the security and supply strategy of the European Union.”

A. Do you have concerns with the European Union developing a dependence on Iranian LNG?

RESPONSE: Yes, I have concerns with the EU developing a dependency on Iran or any single source of natural gas. There are any manner of disruptions that could take place that could threaten Europe's energy security, from natural disasters to security problems to the imposition of sanctions. As a critical part of the U.S. alliance structure and the home of our closest allies, Europe should not be dependent on any single source.

B. Wouldn't it be more difficult to re-impose international sanctions on Iran if Europe develops a dependence on Iranian LNG?

REPONSE: It would not be more difficult if Europe maintains a wide range of energy sources. Iran can be part of Europe's energy mix so long as neither Iran nor any other source dominates that market. In fact, the dependence could work the other way: Iran could become dependent on Europe as a customer of natural gas. In 2012, Europe ended its purchase of Iranian oil, cutting off Iranian sales of nearly 700,000 barrels per day (and, at the prevailing prices, the equivalent of \$70 million per day). This had a tremendous impact on Iran's economy. So long as the context supports imposition of sanctions (such as Iran cheating on its nuclear deal in some significant way), Europe would have a strong interest in supporting our sanctions efforts and -- in fact -- its trade with Iran would be a crucial element of any sanctions campaign.

Questions from Senator Al Franken

Question 1: In July 2014, oil prices were over \$100 per barrel. Today, oil prices are around \$40 per barrel. While these low prices benefit consumers, oil prices often fluctuate and will likely rebound in due time. What are some of the effects—both on industry and consumers—of rapid fluctuation in oil and gas prices? How do fluctuating prices impact long term decisions made by businesses and families?

REPONSE: Oil price spikes harm consumers and the macro economy. They erode spending power and reduce consumption, worsen the current account balance and weaken currencies, and, at times, contribute to rising inflation and trigger tighter monetary policies, which temper growth and investment. Studies analyzing long-term historical

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data found that a 10% per barrel oil price increase would predict 0.7% slower economic growth in the U.S. four quarters after the price rise.¹ James Hamilton also noted in a 2011 study that “all but one of the 11 post-war recessions were associated with an increase in the price of oil” and all but one of the 12 post-war oil price shocks “were accompanied by U.S. recessions, the single exception being the 2003 oil price increase associated with the Venezuelan unrest and second Persian Gulf War.”² The adverse impacts of price shocks seem lower today than in the past, for the reasons I discussed in my testimony.

Beyond the economic impacts of oil price shocks, oil price volatility is itself harmful to the economy and to consumers. Oil price uncertainty can hurt the real economy through several channels. Companies tend to delay fixed asset investments and consumers often postpone durable goods purchases—particularly vehicle purchases—in the face of uncertain oil prices.³ Volatility can also erode consumer demand more broadly, as uncertainty about future income and employment may undermine consumer confidence and induce consumers to increase precautionary savings.⁴ A recent academic paper found strong evidence that greater oil price volatility—irrespective of actual oil price levels—reduces industrial production not only in the United States but also globally.⁵ Volatile oil prices also increase unemployment as industrial production and overall output decline.⁶ In periods of excessive oil price volatility, “an increase in the rate of unemployment occurs because the industrial workforce is more likely to wait in anticipation [of] production level restoration... than to retrain for jobs that require alternative skill sets.”⁷ To the extent oil price volatility also boosts inflation—because of a premium industrial producers attach to the price of their goods in the face of production cost uncertainty—higher inflation may offset the negative impact on employment, as suggested by the inverse relationship between the two in the Phillips Curve.⁸ The academic literature has also documented that oil price volatility exacerbates the negative economic impact of oil price increases and reduces the economic benefits that are normally associated with oil price declines.⁹

Question 2: The federal government has conducted several studies on the effect of increased Liquefied Natural Gas (LNG) exports on domestic prices. In these studies,

¹ James D. Hamilton (2005), “Oil and the Macroeconomy,” University of California, San Diego, p.8, http://econweb.ucsd.edu/~jhamilton/JDH_palgrave_oil.pdf.

² James D. Hamilton (2011), “Historical Oil Shocks,” University of California, San Diego, http://econweb.ucsd.edu/~jhamilton/oil_history.pdf.

³ John Elder and Apostolos Serletis (2010), “Oil Price Uncertainty,” *Journal of Money, Credit and Banking*, Vol. 42, No. 6, 1137–59, p.1139.

⁴ Zoheir Ebrahim, Oliver R. Inderwildi and David A. King (2014), “Macroeconomic impacts of oil price volatility: mitigation and resilience,” *Frontiers in Energy*, Vol. 8(1), 9–24, p.14-15.

⁵ Soojin Jo (2014), “The Effects of Oil Price Uncertainty on Global Real Economic Activity,” *Journal of Money, Credit and Banking*, Vol. 46, No. 6, 1113-1135, p.1130-1131.

⁶ Ebrahim, Inderwildi and King (2014), p. 17.

⁷ Ibid., p. 17.

⁸ Ibid., p.15-16.

⁹ Ibid. p.14

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prices typically increase 14-34%, with one scenario even projecting price spikes up to 54%. While producers support increasing exports to capture more market share, higher gas prices would hurt American consumers. This is especially true for low-income households, who spend a larger fraction of their income on energy bills. Further, higher natural gas prices would burden domestic industries, such as the taconite industry in northern Minnesota. Are you aware of any scenarios where increasing LNG exports does not lead to American consumers paying higher prices for domestic natural gas and electricity?

RESPONSE: Unless the supply curve for a good is perfectly flat, increasing demand (in this case via demand from outside the U.S.) for a product will cause some upward impact on price. Several DOE-commissioned studies have found that increasing LNG exports leads to slightly higher domestic natural gas prices. Importantly, DOE studies have also found that the macroeconomic impacts of LNG exports are positive and rise as the volume of LNG exports rises.

It is important to note that the US natural gas production landscape has changed quite substantially since the publication of the DOE report referenced in the question. The report and its findings are based on the EIA's 2011 Annual Energy Outlook (AEO). To see how outdated those underlying assumptions are, it is enough to look at the reference projections in that forecast for 2016. The AEO 2011 reference case projected nominal Henry Hub gas prices to average \$5.27 per MMBtu in 2016. The EIA's latest projection (in the Short-Term Energy Outlook) now expects Henry Hub prices to average only \$2.25 in 2016 (and the US has already started exporting LNG). The EIA's 2011 AEO expected US dry gas production to average 61.56 Bcf/d (22.47 Tcf) in 2016 in the reference case. The latest Short-Term Outlook of the same EIA expects US dry gas production to average 74.8 Bcf/d. The US shale gas potential turned out to be much more favorable than it seemed when the DOE completed its analysis, and prices are now much lower than anticipated back in 2012.

The magnitude of the impact on domestic prices will be determined by a number of factors, including the ultimate size of the domestic resource base and the amount of LNG that is ultimately exported. While DOE has studied a variety of scenarios, some are far less plausible than others.

The original analyses that DOE commissioned found peak price impacts from 14 to 36 percent depending on how quickly gas exports were ramped up and to what level. The DOE analysis showed that the wellhead price impact could be as high as 54 percent, if production from shale wells proved highly disappointing. The current market outlook is most similar to the scenario that found the smallest domestic price impacts, whereby price impacts peak at 14 percent in 2022 before easing to 10 percent by 2026. Under this scenario, exports gradually grew to 6 bcf per day by 2020. In its 2015 AEO, EIA projects US LNG exports rising to 5.7 bcf/day by 2020 and then 7.4 bcf/day by 2025. Under this

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projection, domestic natural gas prices will average \$5.40 per mmbtu. A recent EIA analysis found that if we exported 12 bcf/day on average through 2040, prices would rise to \$5.70. If we exported 16 bcf/day, prices would rise to \$5.80. These are already very aggressive levels of assumed exports. For comparison, Qatar, the world's largest LNG exporter, currently exports 10 bcf/day.

In October 2014, DOE assessed the impact of US LNG exports, and found smaller projected price impacts than in its January 2012 study. Current market expectations (i.e., the Henry Hub futures strip) indicate that we are the closest to the High Oil and Gas Resource case of the 2014 DOE report in terms of gas prices. In that scenario, the gas price impact of even substantial volumes of exports is very small.

Question 3: While technological advances such as hydraulic fracturing and horizontal drilling have certainly increased domestic oil production, the U.S. still imports more than 7 million barrels of crude oil every day. OPEC countries as a whole remain the largest source of these imports, and it is no secret that many do not share the same geopolitical interests as the United States. Now that we have lifted the ban on crude exports, are we going to have to make up the difference by importing more oil from OPEC countries?

RESPONSE: U.S. crude oil exports have been falling recently, from a peak of 586,000 barrels per day in April 2015 to 374,000 barrels per day in February 2016. Moving forward, as U.S. production begins to rise again with a recovery in oil prices, exports will likely rise as well. Given the capability of the U.S. refining sector, it is likely that increasing volumes of domestically produced light, tight oil will be exported, while greater volumes of heavier oil will be imported than would be the case if US oil exports were prohibited. Those increased gross imports will come from various sources, including OPEC countries like Venezuela that produce heavier crudes.

Because U.S. production will likely be slightly higher if U.S. producers can fetch global prices, U.S. *net* oil import dependence will be likely lower because the export ban has been removed. This is true even though gross imports increase as more light oil is exported and more heavy oil imported than would be the case were the export restriction to remain in place.

Less net import dependence reduces the macroeconomic vulnerability of the U.S. to oil price shocks. In a recent report, the White House Council of Economic Advisers (CEA) found the “resilience of the economy to international supply shocks—macroeconomic energy security—is enhanced by reducing spending on net petroleum imports and by reducing oil dependence.” This is due both to the smaller terms of trade penalty from an oil price shock, and the fact that more of the increase in oil producer revenue stays within the United States.

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Questions from Senator Mazie Hirono

Question 1: Continued volatility in oil and gas prices

It is perhaps easy to forget that oil prices were over \$100 less than two years ago. In Hawaii, we have enjoyed lower prices at the pump and on our electricity bills since we still get the majority of our electricity from oil. But it is the most expensive power in the country, about three times the national average. Mr. Bordoff, can you elaborate on the potential for continued volatility in oil prices over the next few years? Should consumers expect low oil and gas prices to last?

RESPONSE: Predicting oil prices is fraught with peril, but consumers should not expect today's low prices to last forever. The history of the oil industry is filled with rapid swings from boom to bust. While today's oil market is oversupplied, recent global supply outages and geopolitical disruptions—from Nigeria to Kuwait to Canada to Venezuela—remind us that the oil market balance can change very rapidly. Already, the oil price has increased from below \$30 per barrel in January to nearly \$50 today.

If a significant supply disruption were to occur, there is also less of a cushion in the global oil market to handle it. OPEC spare capacity, which can be quickly brought onto the market to compensate for production losses elsewhere is at historic lows. OPEC's effective spare capacity, most of which is held by Saudi Arabia, is currently estimated by the IEA to be 2.7 million b/d,¹⁰ although many believe it is actually much lower. Even the higher number represents less than three percent of global demand. By contrast, for most of the 1990s, OPEC spare capacity averaged closer to five percent of global demand.

Historically, dominant producers have tried, with varying degrees of success, to curb boom and bust cycles by managing supply—from John Rockefeller and Standard Oil to the Texas Railroad Commission to OPEC. Today, the oil market is functioning more like a free market, as OPEC's hold is loosened and it is letting low prices bring the market back into balance. If OPEC, particularly Saudi Arabia, continues to abstain from any effort to manage the market, as the recent OPEC meeting in Doha suggests may be the case, and the U.S. has a notable lag in its ability to respond, the impact may be more price volatility ahead.

Question 2: Development of long-term energy policy

Over 80% of Hawaii's energy comes from petroleum, making it the most petroleum-dependent state in the nation. The long-term cost of dependence on imported oil is the reason that Hawaii has set a long-term goal to get 100 percent of its power from

¹⁰ International Energy Agency, Oil Market Report, April 14, 2016, p. 17.

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renewable sources by 2045. How much should the current lower prices for oil and gas affect Congress's long-term policy plans? And do you think it is advisable for states and the U.S. as a whole to set long-term targets for renewable energy production, carbon emissions, and vehicle fuel economy then allow industry the flexibility to reach those targets?

RESPONSE: Policies that use market-based mechanisms to set environmental targets, but then allow consumers and businesses flexibility in how they achieve those targets, can allow us to meet environmental goals at the lowest possible cost. At the same time, it would be unwise for policymakers to overreact to short-term fluctuations in price. Whether prices are high or low, government still must protect air and water, and do so with carefully created, smart policies aimed at achieving their environmental goals at the lowest cost. Not only can today's market conditions change rapidly, but our ability to anticipate those changes is quite limited, as evidenced by the failure of most analysts to predict the current oil price collapse.

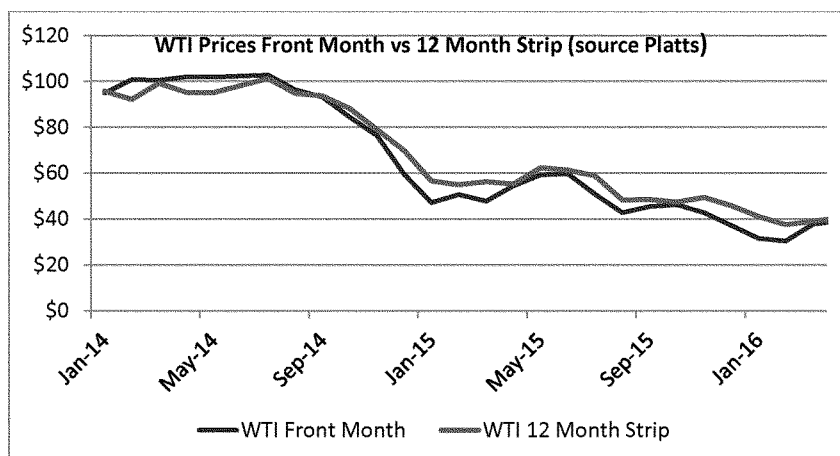
Reducing dependence on one fossil fuel source for power generation is not only important from an environmental standpoint, but from an economic and security standpoint as well. A state like Hawaii improves its resilience through energy resource diversification. When oil prices spike or shortages emerge, the ability to switch to other fuel sources reduces energy security vulnerabilities—just as Japan was able to shift to other fuel sources after the Fukushima nuclear disaster.

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Question from Senator Al Franken

Question: I would like to continue our discussion on breakeven prices that we started in the hearing on April 26, 2016. In a Bloomberg article last year, Shell estimated that its previous plans to drill in the Arctic would be competitive at \$70 per barrel. Is this similar to the breakeven prices you have seen for drilling in the Atlantic or Arctic Oceans, and how long do you think it will be before the price of oil returns to those levels?

Platts Analytics is in general agreement that prices needed to incentive new drilling for offshore production is in the \$70 per barrel range, and that for projects currently producing, break even costs are estimated in the low \$40 (WTI) per barrel range. As volatile as prices have been, and as much attention as the “front month” or currently traded prices is given from the media, it is probably more important to consider the price of the 12 month forward curve, the price on any given day that WTI is valued at for the upcoming 12 months. Looking at the image below once can see that with a 2 month exception, on the 1st of each month since January 2014, that 12 month strip price has remained above \$40 per barrel.

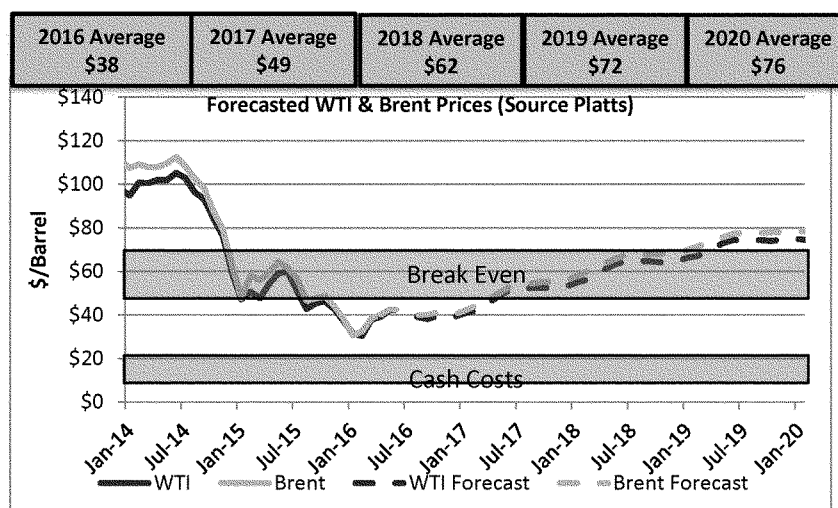


This difference in pricing is important to realize when one considers that offshore platforms generally produce for 16-20 years without the steep decline curves recognized by onshore shale wells. Investment/production from offshore platforms are considered to

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be long term investments, and therefore production decisions around volumes currently flowing, may not be impacted by (relatively) short term price movements.

As stated though, when we look forward, higher prices are anticipated in order to incentivize new drilling projects both on and off shore. The sub-\$40 price environment in which we find ourselves today may be short lived as current spare capacity becomes utilized to offset natural declines we expect to see globally. From a global perspective, the longer we remain in the current low price environment, the more risk there becomes to global production (particularly from nations with less stable economies), as low prices being recognized by many producers may be inadequate to provide even maintenance CAPEX, let alone new exploration.



While many view higher prices as a negative, I believe it may be construed as a positive economic indicator. We sit in today's low price environment, simply put, because supply has outstripped demand and demand growth is happening at a pace inadequate to absorb what we are creating. Prices will rise when demand occurs that will require additional production to come online. This demand growth may be considered a sign of growing economies rather than weakening.

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Question from Senator Mazie Hirono

Question: *Low oil price impacts on refinery market*

Ms. Minter, both of Hawaii's oil refineries have been put up for sale in the last three years. In your testimony, you state that the decline of prices for refined products like gasoline and diesel is accelerating and that the decline is squeezing the profit margins of refineries. Can you expand on what the decline in refined product margin means for the refinery market what further impacts could happen if oil prices remain low globally?

Declining refined product margins are not a result of low oil prices, but have developed in spite of low oil prices. The decline in refining margins is indicative of the global oversupply of energy that began with the recent surge in oil production. At the end of the day, it is not the barrel of oil that we all consume, but the refined products created from those barrels. Given the order of magnitude that supply growth has outstripped demand growth, as our global refineries have been running at high utilization rates, it is not surprising to see this oversupply phenomena move "downstream" to the refined product markets.

As the global oil markets inevitably rebalance themselves, through a combination of slowing supply growth and increasing demand, the refined product markets also should come back into balance. It is also notable that refineries that serve local, indigenous demand that are naturally "short" product such as Hawaii tend to enjoy significantly higher margins than refineries in regions that are net exporters, such as the US Gulf Coast.

Looking at Hawaii in particular, the two refineries in the state have operational capacity of just over 150,000 barrels per day, (per EIA) which while clearly is very significant to Hawaii, makes up less than 1% of US refining capacity. Looking at the recent transactions, I do not think they should be considered alarming, but more than likely, for a company such as Chevron, who recently announced the sale of its Hawaiian refinery to One Rock Capital Partners, merely reflect a decision to focus their resources on their larger portfolio of assets. Also, it would seem that in the case of a market as unique as Hawaii, an island which is completely dependent on product that it either needs to create or import, while production/ refining cost are higher in an island setting rather than the US Gulf Coast, that there is a measure of supply security that will be maintained only by continuing to operate refineries within the state.

Question from Senator Mazie Hirono

Question: US LNG Export Capacity

In February a company began exporting LNG from a facility in Louisiana. Ms. Palti-Guzman, your testimony highlights the effects of decreased global demand for LNG over the last year. Meanwhile, there are other export facilities currently under construction and in line for permits to construct. Are U.S. companies in danger of locking in too much export capacity by beginning the construction on export facilities that are unlikely to run at full capacity?

Response by Leslie Palti-Guzman

The combination of 1) unique US LNG business model (HH index, no destination clause, no take-or-pay) and 2) challenging market environment means that US LNG exports facilities are unlikely to be utilized at full capacity.

US LNG is all about flexibility. Buyers are free to walk away from previously agreed purchases by giving notice and US LNG is not bound to any specific market and can be easily swapped or sold on the spot market, which will create more liquidity and efficiency in the global gas market, but also more uncertainties for US LNG offtakers. In stark contrast, most of the Asian LNG contracts remain trapped into take-or-pay contracts and earmarked to a specific market, creating more security of demand, but less room for swaps and trading operations.

US will likely assume the role of swing supplier within a few years, which will stabilize global gas markets in period of supply or demand shock. But it means also that US LNG facilities will adjust their production over time according to global LNG demand: US LNG will export when the world needs US LNG, and will not export or export less when demand is more muted. As such, the US is set to become one of the world's primary go-to supplier in times of crisis, which will be particularly helpful for European or Asian buyers. After Fukushima, Qatar supplied Japan with some extra 10 mt of LNG that were readily available as spare capacity—meaning divertible flexible supply that was not attached to any long-term contract or destination.

Eroding international prices and weakened demand in top LNG consumer countries make the US shale-to-LNG market less attractive than when investment decisions were taken. Current uncertainties surrounding long-term natural gas demand means that the companies developing new and additional facilities in the US are taking leaps of faith. Medium-term and long-term demand for LNG will be one of the most critical elements to watch in determining whether the world needs US LNG and how much. US LNG will have to remain competitive because natural gas has to compete for market share with cheaper coal and zero-emission renewables. There are some reasons to be optimistic. More affordable and accessible LNG creates renewed or new appetite in several countries, making also the environmental argument of favoring gas over coal

or fuel oil more compelling. However, demand from these new, opportunistic importers could be fickle if prices rebound, and some may increase domestic production, secure alternative import supplies, or displace natural gas with competing fuels.

2016-2020: US LNG capacity utilization is likely to be around 85%

The vast majority of US LNG volumes will be lifted despite reduced appetite and smaller profit margins, as US LNG offtakers will be eager to quickly recover their fixed costs (e.g. liquefaction fees). However, competition from other suppliers and weaker demand will likely keep utilization rates below 100%. The global liquefaction utilization rate averaged 84% in 2015. I believe that US LNG liquefaction facilities will run at this rate or below and with important seasonal and yearly variations.

As US LNG takes off, it will trigger a competitive response from rival suppliers, especially in Europe. Russia's Gazprom is prepared to sell its gas at marginal cost to European consumers for an extended period to drive European prices lower to the point where it is no longer profitable to import US LNG (though steep discounts are likely not sustainable, and I believe Europe will be one of the leading market for US LNG exports).

Post-2020, the aggregated average liquefaction utilization for US LNG could evolve depending on future energy policies, commercial decisions, and geopolitics. The jury is still out, as many political and commercial decisions that will impact US LNG exports in Europe and elsewhere are still in the making. A higher US LNG output in the longer-term would require a strong, unequivocal signal for the use of natural gas as a transition fuel post COP21.

US LNG facilities are likely to adjust their production over time according to global LNG demand, US domestic gas demand, competitiveness of oil-linked LNG, energy policies, and the price war to keep US supply out of the market.